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MOTORSHIP

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Vol. 3 No. 5

Devoted to Commercial and Naval Motor Vessels

May, 1918

SEATTLE NEW YORK

One of nine full powered Winton engined wooden motorships under construction in the yards of the Elliott Bay Shipbuilding Co., Seattle, U.S.A.

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Vol. 3 SEATTLE, U. S. A., MAY, 1918 No. 5

Oil-Engine Sprayers or Pulverizers

No. 1

By A. H. GOLDINGHAM and T. C. O'BRIEN

IN this and in the following articles it is proposed to describe and discuss the various features of the many different designs of fuel injection devices employed in connection with both hot surface type and Diesel oil-engines.

With the modern designs of these types of oil-engines such devices may be generally divided into two classes.

1. That through which the liquid fuel mixed, or combined, with highly compressed air is injected.

2. That design through which fuel only is injected into the combustion space; generally known as the solid fuel-injection type.

These two classes, however, will again be subdivided further in the descriptions and detailed classifications of the following articles.

The modern and up-to-date fuel-injection valve, pulverizer, or sprayer, is naturally of greater interest than the older designs, some of which have now become obsolete; but, in order that the reader may be conversant with the whole subject, it is thought best in the first place to describe and illustrate the fuel-injection devices employed with those oil-engines built first thirty or forty years ago, and at the same time point out the defects of such apparatus and record the results obtained with them. In this way a correct comparison between the older devices and the modern and improved designs can be formed and the progress which has been made can be fully realized.

The spraying device of the hot-surface and Diesel oil engine has at all times and in all designs received particular attention as to its design, construction and as to the materials employed. With modern oil engines, having a higher range of pressures in the cylinder than the older designs, and especially with all Diesel engines, the fuel injection valve, nozzle, pulverizer, or sprayer, is subjected to very high pressures and temperatures when in operation. Under these conditions it must also be so delicately adjusted that it can continuously and satisfactorily handle the minutest quantities of fuel at each period of combustion. Notably is this the case when the engine is operating at light loads.

In many instances the modern oil-engine it must be remembered operates on very heavy crude-oils or tar-oils, as well as fuels containing traces or a small percentage of matter injurious or destructive to the spraying or fuel injection apparatus, and unless specially constructed of such material as will withstand this usage, it would quickly fail in service. Again, the modern oil-engine both in industrial installations and in marine work is expected to stand up to its work continuously twenty-four hours per day for several days or weeks at a time. Experience, too, has shown that oil-engines of good builders will perform this service satisfactorily. There has also been in recent years with some designs a tendency to higher rotative speeds, notably in those engines for electrical work as also those installed in submarines, etc. With an engine, for instance, operating at 240 r. p. m. the spray valve mechanism opens and closes twice each second. The fuel is injected during a period of only about 30° to 40° of the crankpin circle, thus the opening and closing of the valve is performed in 0.0208 to 0.0277 of a second with such an engine. While it is true that the great increase in the thermal efficiency of modern engines is due very largely to the great increase of the compression pressures yet this improvement is also in part due to the improved methods of fuel injection whereby each particle of fuel is made to come more readily in contact with, and have its surface more completely exposed to the oxygen in the combustion space of the cylinder.

The importance of this matter has been more fully realized in the last few years than was the case formerly. Taking, therefore, these remarks into careful consideration, it will not be out of place to give time and space to a study of the fuel inlet devices that are available for illustration and description.

One of the earliest internal combustion engines to operate with petroleum or kerosene as fuel was the Brayton petroleum engine produced in the United States about 1875. The device for introducing the fuel into the cylinder described by Prof. Robinson* is shown at Fig. 1. The fuel was delivered for each combustion stroke by a pump to the porous material shown at (e). The swift current of inrushing compressed air entering through (A) carried the volatilized petroleum vapor into the motor cylinder, through the opening controlled by the valve (b). A valve (g) held in place by a flat spring separated the vaporizing chamber (e) from the passage (p)—a flame interceptor of wire gauze shown at (h) was a'so inserted to prevent the flame striking back and igniting the vapor in (e). Ignition of the charge was caused by a petroleum flame burning continuously in chamber (h). With this type a mean effective pressure of only 30 lbs. per sq. in. was shown by the indicator card with a fuel consumption as high as 2.7 lbs. per b. h. p. hour and a thermal efficiency of approximately 6% only.

The Priestman spraying nozzle for heavy-oil is

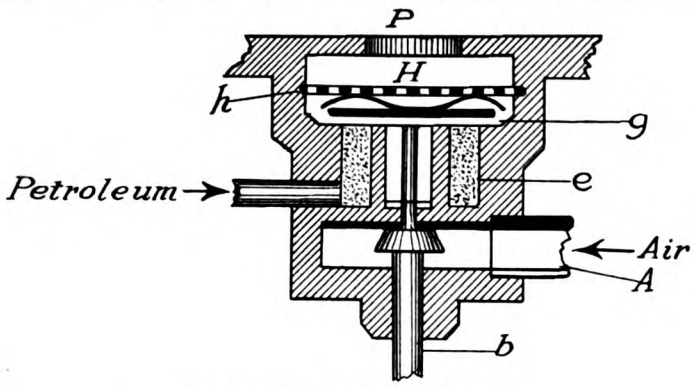

FIG. 1. SPRAY VALVE, BRAYTON

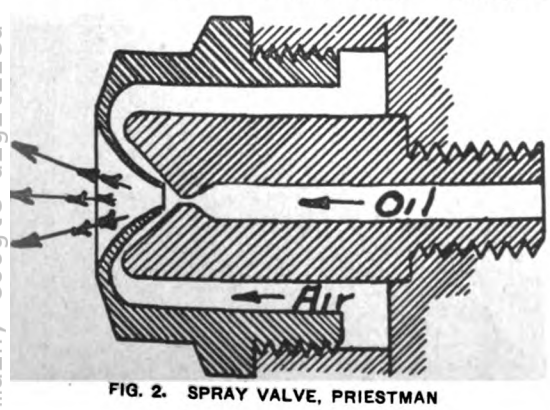

FIG. 2. SPRAY VALVE, PRIESTMAN

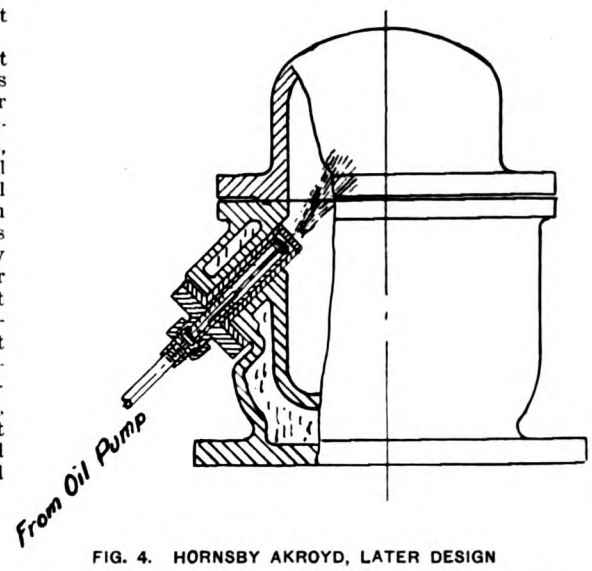

FIG. 4. HORNSBY AKROYD, LATER DESIGN

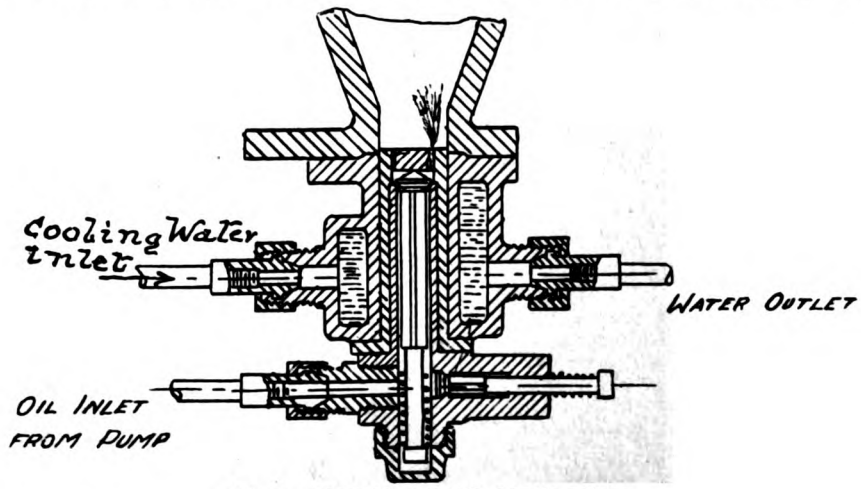

FIG. 3. HORNSBY AKROYD, EARLY DESIGN

*Gas and Petroleum Engines" by William Robinson, M. E., 1902, page 657.

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shown in Fig. 2. The explosive mixture of fuel and air first entered a vaporizing chamber which was heated by the exhaust-gases passing around it and then the mixture was drawn into the combustion space, compressed and ignited by electric spark. This engine was first built about 1887. The compression pressure was approximately 28 lbs. The fuel consumption was 1 lb. per b. h. p. hour and a thermal efficiency of 14% was recorded. In neither of these two types was either economy or reliability of operation to be compared with oil engines of subsequent design.

The next oil engine of importance to be placed on the market was the Hornsby-Akroyd type patented by Akroyd Stewart and others about 1866.

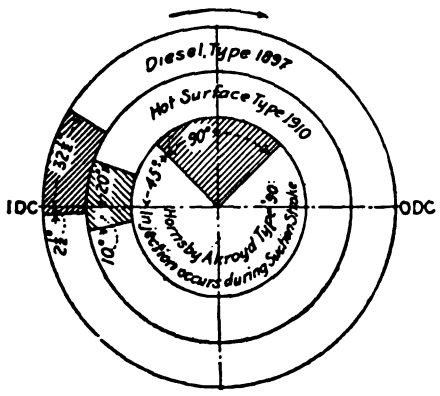

FIG. 5. PERIODS OF FUEL-INJECTION

The first spraying device of this design is shown at Fig. 3**, and the later design is shown at Fig. 4. It operated against atmospheric pressure only and was comparatively simple in construction. The spraying effect was obtained by the minute passages in the steel spray nipple through which the fuel was forced by the pressure due to the very quick action of the fuel feed pump. While exceedingly simple and reliable in operation the degree of vaporization was low, resulting in comparatively poor combustion and possible carbonization in the vaporizing chamber attached to the cylinder into which the fuel was

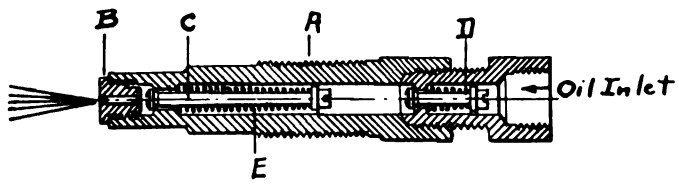

FIG. 6. SPRAY VALVE, MIETZ AND WEISS

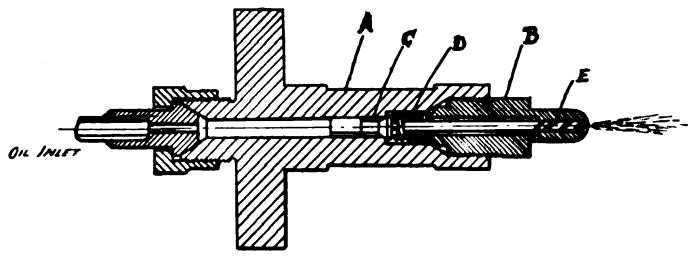

FIG. 7. SPRAY VALVE OF A SMALL TWO-CYCLE, CRANK-CASE COMPRESSION TYPE OF OIL-ENGINE. NOW DISCONTINUED

injected. In 1893 records show with this type, compression pressure of 45 lbs., m. e. p. 37.5 lbs., fuel consumption 0.95 lbs., and thermal efficiency of 17%. The period of the fuel injection in the cycle of the different oil engines is shown in Fig 5.† It will be noted in the types above referred to that the fuel was injected during the suction period or before compression was begun. The compression pressure could only be carried to a point (seeing that both vapor and air were being compressed) where the temperature generated in addition to that of the hot surface was not sufficient to cause preignition in the cylinder. This fact coupled with the comparatively crude methods of spraying and vaporization of the fuel and lack of combination of the particles of the sprayed fuel with the oxygen, accounted for the low thermal efficiencies shown in the above mentioned figures.

The sprayer of the Mietz oil engine is shown at Fig. 6. As will be noted from the illustration it consists of the spray valve body having the spraying nipple inserted at the one end which projects into the combustion space of the cylinder. Two check valves, C and D, are used which are necessary first to produce a sharp precise spray and secondly to prevent the blowing back of the fuel by the explosion pressure. The fuel is furnished by a small plunger pump and enters the sprayer as shown in the illustration. The washers which act as guides to each of the springs, which hold the valves on their seats, are each slotted so as to allow free passage of the fuel. This type of engine is very largely in use both for marine and stationary purposes in sizes up to 500 h. p. in the multi-cylinder design. Like the next engine referred to, it is of the hot-surface, crank case compression, two-cycle type, but with the Mietz engine steam generated in the cylinder water jacket is injected into the combustion space with the fuel. With a compression pressure of about 75 lbs. and a m. e. p. of 50 lbs. the fuel consumption is 0.7 to 0.8 lbs. per b. h. p. hour. [We believe we are right in saying that recent designs of Mietz engines show a much better economy of fuel consumption than that mentioned by the authors.—Editor.]

The sprayer shown at Fig. 7 was used in connection with a small two-cycle, crank-case compression type of oil engine, the manufacture of which has now been discontinued. With this sprayer comparatively good vaporization of the fuel resulted and for this class of engine excellent combustion was effected with a compression pressure of 80 lbs. and m. e. p. of 45 lbs. The fuel consumption was 0.8 lb. per b. h. p. hour. This sprayer consists of the valve body (A) into which the nozzle (B) was tightly screwed. The fuel passed first by the check valve (C) held in place by the spring (D) between the shoulder in the check valve and spray pin (E). The fuel passed also through the fine spiral channels shown on the lower part of this pin to the spray nozzle. Trouble sometimes resulted from the spring becoming loose, thus allowing the spray pin to block the passage of oil and at the same time the check valve ceased to close on its seat.

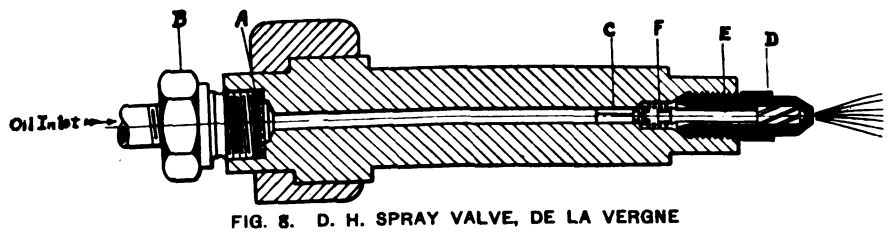

FIG. 8. D. H. SPRAY VALVE, DE LA VERGNE

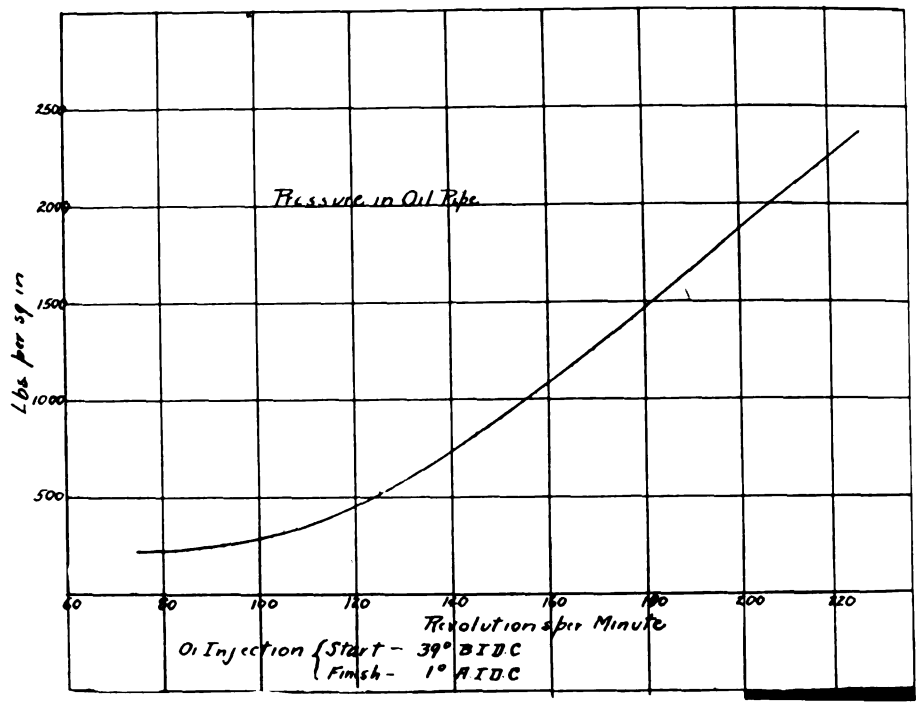

FIG. 9. CHART SHOWING VERY HIGH PRESSURES IN SPRAY VALVES OF THE PUMP-INJECTION TYPE

FIG. 10. CHART SHOWING PRESSURES RECORDED IN THE COMBUSTION-SPACE AND CYLINDER AT THE SAME TIME AS THE OIL-INJECTION PRESSURES OCCUR IN FIG. 9

It is the purpose of the writers generally to follow the development of the oil-engine sprayer in chronological order and accordingly the pioneer Diesel engine sprayers should have been referred to previous to the last two devices illustrated, as the Diesel patents were dated 1892. It has, however, been thought best to describe these and the following examples in the sequence shown and then in the second article illustrati

(Continued on following page)

**The Heavy Oil Engine by A. H. Goldingham, A. S. M. E. Transactions, 1915.

†Design and Construction of Oil Engines by A. H. Goldingham, 4th Ed., page 10.

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Building the "Eagle" Class of Submarine Destroyer

ACCORDING to Mr. Geo. Talbot Odell in the New York "Evening Mail," the "Eagle" class of submarine-destroyers now being built by Henry Ford are motor-driven vessels; but this we think is an error, as our information is to the effect that steam-turbines and boilers are being used as propelling power, and of course, the boilers will be oil-fired, which may account for Mr. Odell's mistake.

However, many of Mr. Odell's remarks are of great interest so we have no hesitation in reproducing some extracts herewith.

"Mr. Ford's most wonderful achievement is the 'Eagle.' Not perhaps the boat itself; but, the creation of the boat and of the plant in which these ships are to be built. Just look at this schedule and imagine what it means in the matter of labor and organization."

"January 18th the first work upon the design of this boat was begun.

"January 26th the first piece for the boat was manufactured.

"February 20th started construction of the shipyard.

"April 10th started manufacturing of boats at the shipyard.

"May 8th will begin assembling the first seven Eagles.

"July 1st will launch first 'Eagle' and by the first of the following month it is expected that the production will reach one boat a day, launched, equipped and ready to send across the ocean."

"Mr. Ford is no shipbuilder, but when, about the first of the year, he conceived the idea that swift, light motor-boats could be used effectively for the destruction of submarines, he immediately started getting up a design. A number of draughtsman in his motor-car factory were called in and Mr. Ford gave them his idea about the kind of boat he thought would be most effective for the purpose, and asked them whether they could design one. These men were not marine draughtsmen, but they studied marine construction nights and drew their plans during the day. They made plans for both the hull and the engine. They worked from sixteen to eighteen hours a day, and on the seventh day they had completed their task."

"The plans were approved by naval officers, and on the eighth day Mr. Ford began the construction of the first 'Eagle.' That boat is now standing in the Ford motor works. It is 200 feet long, and has a burden of a little less than 1,000 tons."

"It will be equipped with an oil-engine, of special design, calculated to send it through the water at express-train speed, and it will be fitted with every known device for the destruction of submarines."

"Naturally a motor-car factory is not equipped to build boats on a scale such as Mr. Ford purposes to build Eagles. Therefore, it became necessary to have a shipyard. Mr. Ford had a large tract of land upon which he was building a blast furnace."

"The only water near this tract was a thin stream of insufficient depth to launch even a rowboat, but six miles away was the Detroit river, and Mr. Ford immediately gave orders to bring the river to his shipyard by dredging a canal six miles long and about seven feet deep. Today that work is nearly completed."

"The land was marshy, and in February frozen. On the 20th of that month, plans for the yard were completed and work begun. This necessitated the laying of railroad tracks to bring in material; the sinking of concrete piers, as foundations for the huge buildings; the building of a dock, the installation of hundreds of machines, and not the least, the building of sewers, the draining of the land, and bringing water from more than two and two-half miles away, for mixing concrete and for other purposes."

"The first building erected was the fabricating plant, in which the machinery for molding and punching the plates, and for making and shaping the various other parts of the hull is installed. That building is 150 feet wide by 450 feet long."

"In front of the fabricating plant will stand the assembly building, 1,700 feet long by 300 feet wide, with three tracks running the full length of it, and on each track seven 'Eagles' will be assembled simultaneously, making twenty-one boats under construction at the same time. This building will be completed in one month's time."

"Beyond the assembly building is the basin, concrete-lined, into which the ships will be launched, and leading out from that again, along the canal, are the docks on either side, 1,100 feet long, from which boats will be outfitted."

"The engines will be built at the Ford motor works, and will be sent to the shipyard ready for installation in the hull as soon as it is completed. It is not considered proper that a description should be given at this time, but I may say that it is designed for fuel-oil, of which there is a plentiful supply in this country. About half a mile away from the ship plant the Government is erecting a naval training station, where men will be trained to take over the 'Eagles' as soon as they are completed. The whole plant is under the control of the Naval department and the guns and other equipment will be installed upon the boats by navy men."

It is our opinion, which may or may not count for much, that the efficiency of these vessels would considerably be increased were they fitted with crude-oil internal-combustion-engines. But, we are informed by an eminent naval official at Washington, that any form of reciprocating-engine is not suitable for these "Eagle" boats.

We have not seen the vessels or their designs, but "on the face of it" we cannot see why motors cannot be used, and we know of at least one case abroad where high-speed Diesel oil engines are being used, the total power of which being 6,000 b. h. p., or equivalent to 7,500 steam i. h. p.

Possibly, it is the question of strength which the U. S. Naval official has in mind, because of the lighter engine foundations that can be used with turbines. But, if Diesels were used, all the fresh-water (probably 100 to 200 tons) required for the boilers would be eliminated and much of that weight saved could be incorporated into the hull and engine-beds, making a stronger vessel without increasing the displacement or reducing the speed of the ship.

We believe we are correct in saying that (if it is not desirable or advisable to spend the time developing domestic oil-motors of sufficiently high power) complete working drawings are available to America of suitable Diesel engines of several leading European designs, and of 1300 to 2500 shaft horsepower per engine. This means a maximum of 7,500 shaft horse-power per triple-screw boat, or equivalent to steam-machinery of about 9,000 indicated h. p.

What this means will be apparent when we point out that a Diesel-driven boat of this power will only require 36 tons of heavy-oil fuel for each 24 hours running at full speed; whereas a steam-driven boat of the same power will need 96 tons of oil-fuel for each 24 hours of running at full speed when in service.

Of course, the boats will not run continuously at full speed when in service, but just consider what this difference in consumption means to the tankship fleets that have to carry the fuel-oil to the allied naval bases.

Assuming that the "Eagle" boats were run at two-thirds power, and that 50 were Diesel-driven and 50 were steam-driven, it would mean 24 tons and 64 tons of fuel-oil per day per boat respectively if of this power. Or, 1200 tons and 3200 tons of fuel-oil per fleet per day respectively.

One month's (30 days) necessary supply of fuel-oil for the two fleets would be represented by 36,000 tons and 96,000 tons respectively. In other words there would be a direct saving of 60,000 tons (10,080,000 gallons) of the fuel-oil, that will have to be transported across the Atlantic with the fleet, if Diesel engines were used.

Detachable Motors for Canal Barges

IF experiments that have been carried out on the British canals may be regarded as a guide, it s possible that detachable motors can be used for he purpose of propelling small barges on the New York State Canal, and thus rapidly convert ow-barges into power vessels, which, of course, offers many advantages, because motors of the letachable type can be fitted into a short space of time. This means that when a barge has reached its destination, the motor can be atached to another barge, provided, of course, the structional arrangements have been made in advance.

Recently in England, a small American detachable motor was fitted to a canal barge, which nade a long-distance round trip towing another anal-barge astern. These barges are similar to hose now being used by Inland Waterways and Dock Section of the British War Office for use abroad. Each unit has been put to a practical test before shipping abroad, by making a journey to a local colliery and bringing back a fully loaded barge.

On the special test in question, the outward journey, a distance of 28¼ miles, was made in 6 hours and 45 minutes, the boat and the tow both being light. The boats were loaded in two hours at the colliery and the return run occupied ten hours. The canal route was very winding, and was full of traffic both ways, but no difficulty was experienced in passing numerous single horse-drawn barges, or in negotiating locks, of which there were three each way. A single horse-drawn barge usually requires two days for its return trip, so the great advantage of the little detachable motor is obvious.

OIL-ENGINE SPRAYERS OR PULVERIZERS.

(Continued from preceding page)

he Diesel sprayer development from 1892 onward o those of modern Diesel engines.

Referring to Fig. 5 the period of fuel injection s there shown which existed at the different ears indicated. In Fig. 8 is shown the sprayer sed in connection with the De La Vergne "DH" orizontal four-cycle crude-oil engine developed bout 1912 and has the fuel injected as shown in ig. 5 of the 1910 period. There are now several xcellent hot-surface type oil engines built, hav-ig mechanical sprayers of somewhat of this de-cription and with a period of fuel injection sim-ar to that above referred to such as the Black-one oil engine, the Ruston and Proctor design, oth built in England. With the type employing he sprayer shown in Fig. 8 a thermal efficiency 25% and compression pressure of 170 lbs. and . e. p. of 70 lbs. is recorded.

This spray valve belongs to the pump, or solid-jection, classification. The spraying of the fuel this type depends on the pump injection pres-re caused by the velocity of the pump plunger parted by the rapidly rising contour of the m operating it.

It is necessary in this as in other types to elim-ate any air pocket in either the oil pipe or spray lve. To insure continuous operation the fuel ust be thoroughly and carefully strained. Should all particles of dirt be carried in with the oil ey will clog the fine channels of the spray pin d nozzle and will prevent smooth operation.

The spray is equipped with a fine wire gauze rainer (A) which is held in place by the plug). The oil hole shown through the spray valve dy is made large enough to admit the check lve (C) which seats on the valve body as shown. he steel spray nozzle (D) is screwed into the valve body and has an oil-tight seat made by contact. The spray pin (E) is a ground fit into the spray nozzle and carries a small shoulder at its outer end. The check valve spring is fitted between this shoulder and the extension guide of the check valve.

The end of the sprayer pin acts as a stop to the check valve, thus preventing the valve from working out of the guide should the strength of the spring be overcome, which might otherwise allow the valve to become wedged crosswise in the guide.

The spray pin has several spiral grooves recessed in it, these give a whirling motion to the fuel and at the same time slightly atomize the fuel. The hole in the spray nozzle is enlarged or flared at the outer part. The pressure of the fuel injection pump forces the oil through these grooves and opening into the combustion chamber.

In Fig. 9 a chart is shown which gives a clear idea of very high pressures obtaining in spray valves of the pump injection type. The pressure increases, it will be noted, with the revolutions of the engine and reach a maximum of 2,300 lbs. at full speed.

Fig. 10 is a chart showing the maximum pressures recorded in the combustion space and cylinder at the same time as the oil injection pressures occur in Fig. 9. It can be seen that both pressures are in relation to each other and vary with the horsepower.

This is the first of a series of technical articles by A. H. Goldingham and T. C. O'Brien which are to appear in Motorship, the second installment of which will appear in an early issue. All illustrations, etc., included in this series are copyrighted by the authors.

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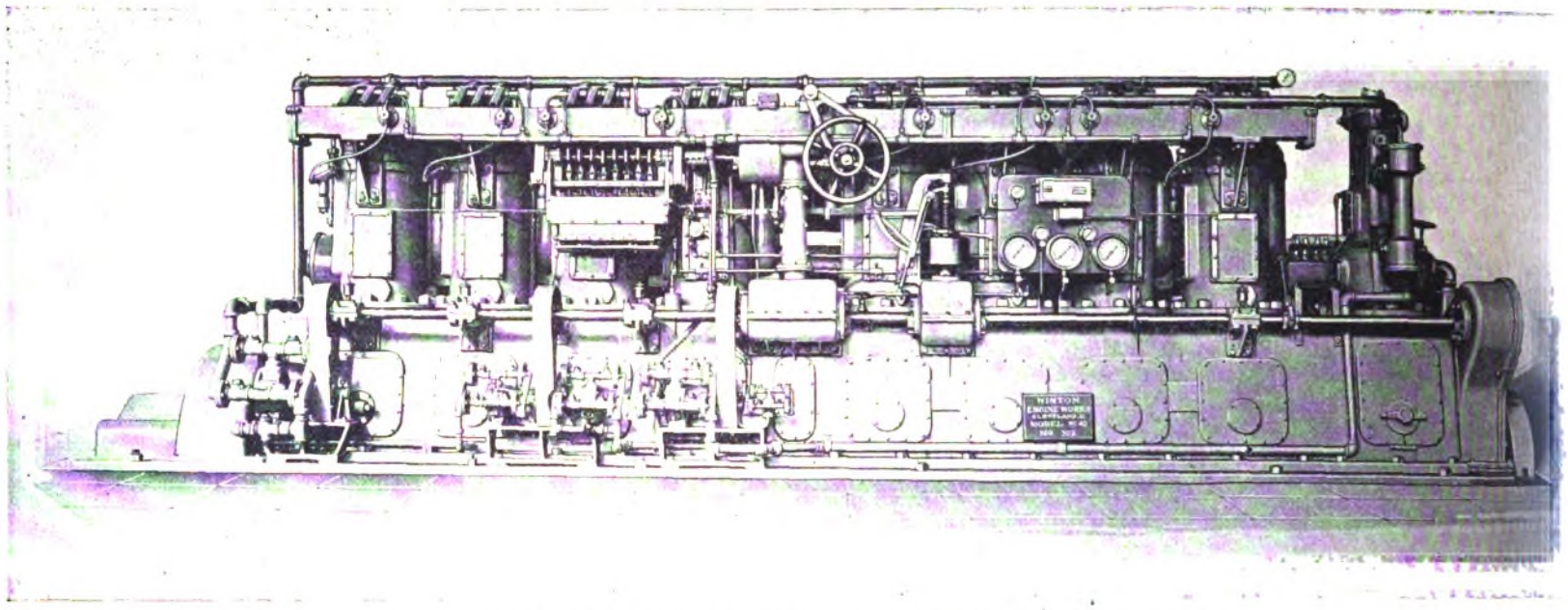
The Latest Winton Marine Oil Engine

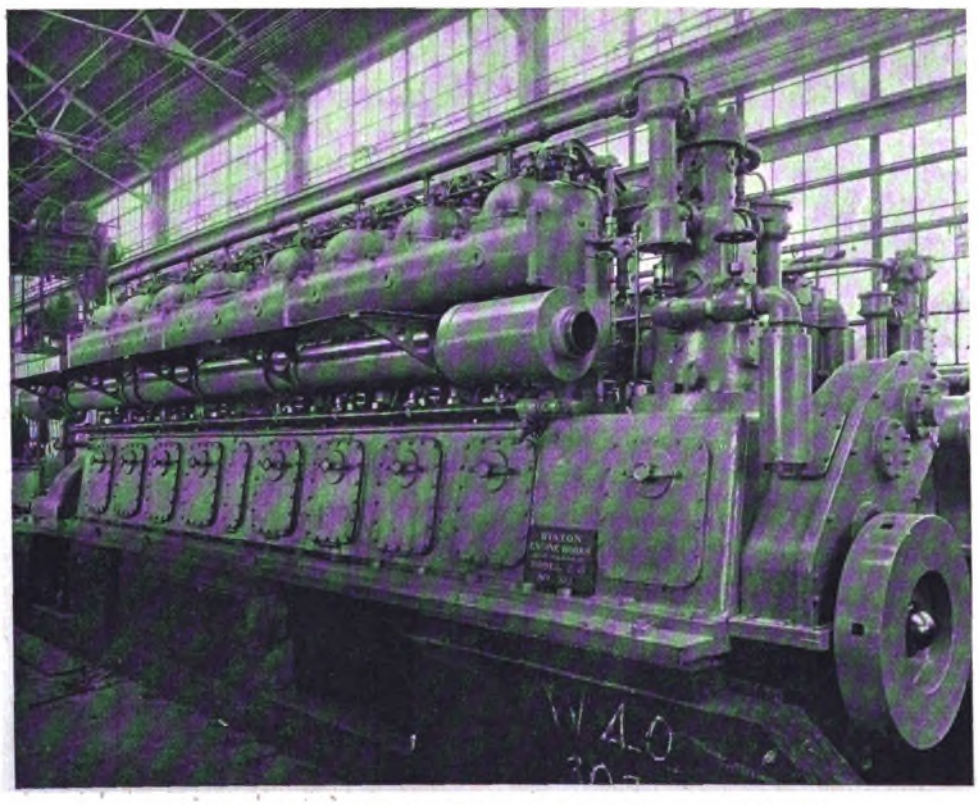
An American Designed and Built Diesel-Type Reversible Motor

AN unfortunate and erroneous impression has been made in some quarters that Americans cannot build Diesel engines and that our mechanics and operators are not sufficiently skilled. Only quite recently a statement appeared in a daily newspaper to the effect that the Diesel crude-oil engine is an invention of the Devil and that it takes a German devil to construct and operate it. In more than one sense it is strange how such stories get around, and no doubt they have been deliberately spread in some cases, and in ignorance of the real situation in others. That America can build good and reliable engines can be ascertained by those who study the situation until they accumulate sufficient interest to visit the various domestic engineering works engaged in the building and development of this class of marine machinery.



MODEL W. 40. THE 500 B. H. P. SIZE OF THE WINTON FULL-DIESEL TYPE MOTOR

With one or two exceptions American marine Diesel engine designers have followed more closely submarine-type motors and large marine gasoline motors, rather than steam engine practice as have done most European engineers. This partly is due to engines that as yet have been built (with the exception of those of the "Maumee" and "Fulton") have not exceeded 600 shaft horse-power, and possibly that when larger sizes are constructed they will be along marine steam engine lines in order to facilitate the training of steam engineers to be operators of Diesel engines. But, because high-powered merchant Diesel engines have not been built in large numbers in the U. S. A. is no reason for assuming that Americans cannot build them—and successfully, too! At the same time the marine crude-oil engine is a serious engine, and should be regarded with due seriousness, and to treat its design and construction lightly means promise of failure at the very outset—a repetition of the failure that came to some of the great European engineers who rashly commenced the construction of high-powered sets without any previous experience. The pitfalls into which they fell must be avoided at all costs. Even if some American concerns do not take a lesson from the past blunders of Europeans and meet with the same obstacles and troubles, we still must not say that Americans cannot build



BACK-VIEW OF THE WINTON 500 B. H. P. MARINE DIESEL ENGINE

Diesel engines. It is purely a question of undertaking the construction in a proper manner.

Only at the recent New York Motor Boat Show we were discussing the oil-engine question with the representative of a well-known firm of marine gasoline engine manufacturers. "Oh yes, we are thinking of building oil engines." "The old man," (referring to the head of the concern) "says he can build a good oil engine. He is going to put a new cylinder head and fuel-injector to our present motor. That will make a fine crude-oil engine."

Such a belief we cannot too strongly censure for the apparent woeful lack of knowledge of the many initial problems of the heavy-oil burning engine to be faced by the inexperienced means that this builder, depreciating his task, will blissfully drift into a veritable sea of trouble, and will be drowned in his own boundless confidence and over-optimism, unless brought to proper realization of the full seriousness of the designing and engineering work, before he reaches the outer circles of the maelstrom and is drawn into the vortex from which there is no escape without paying the penalty, as have many who have followed the same current before. But even if he pursues this mistaken course and eventually discovers himself floundering in a whirlpool of overlooked problems, it still does not mean that Americans cannot build oil-engines. No doubt, that man is a most capable engineer and could build a successful marine crude oil engine if he started in the right direction and with true realization of what he had set out to do. But often we drift into deep water before we know it, and it is a distinctly wise policy to keep close to the shore until we have learned to swim. Then we can strike out without trepidation, although perhaps it is well to keep a wary eye open for rocks and other submerged dangers.

Recently we paid an interesting visit to a large engineering works, that previously were devoted to marine gasoline motors for large yachts, but which now are constructing Diesel engines almost solely for merchant vessels, the gasoline motor side of their business have become almost decadent during the past year, with the exception of some Government work. Yet they are almost new comers to the heavy-oil engine field.

This firm did not, however, depreciate the task of designing and constructing Diesel engines of the powers which they have attempted, and set about building a special design worthy in comparison with their other excellent engineering productions. The pleasing results obtained so far are partly due to careful design and good engineering, and partly because they have been assisted by the fact that the problems of heat and stresses of the powers that they have built are by no means so severe to contend with as are those engines with cylinders of twenty, twenty-five and thirty inches diameter, and because to obtain their powers they prefer to multiply the number of small cylinders rather than obtain the same output from fewer big cylinders.

We refer to the Winton Engine Works of Cleveland, Ohio, who, considering the short time they have been engaged in oil-engine construction have made remarkable strides, and the number of engines completed during the past eighteen months, indicates that had this Government embarked upon the construction of a huge fleet of motorships instead of steamers there would have been no ultimate delay in the machinery construction side of the program, contrasting with

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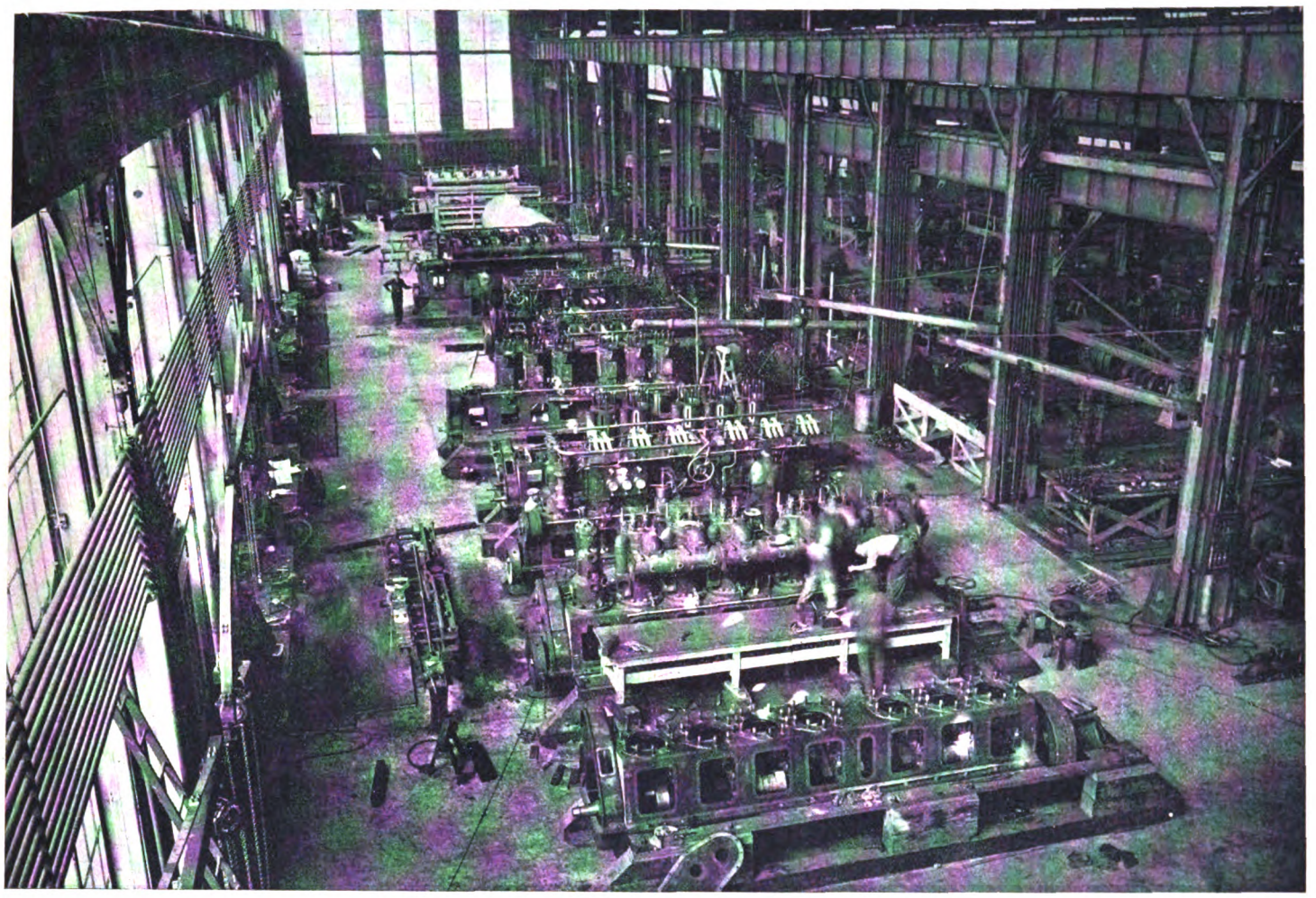
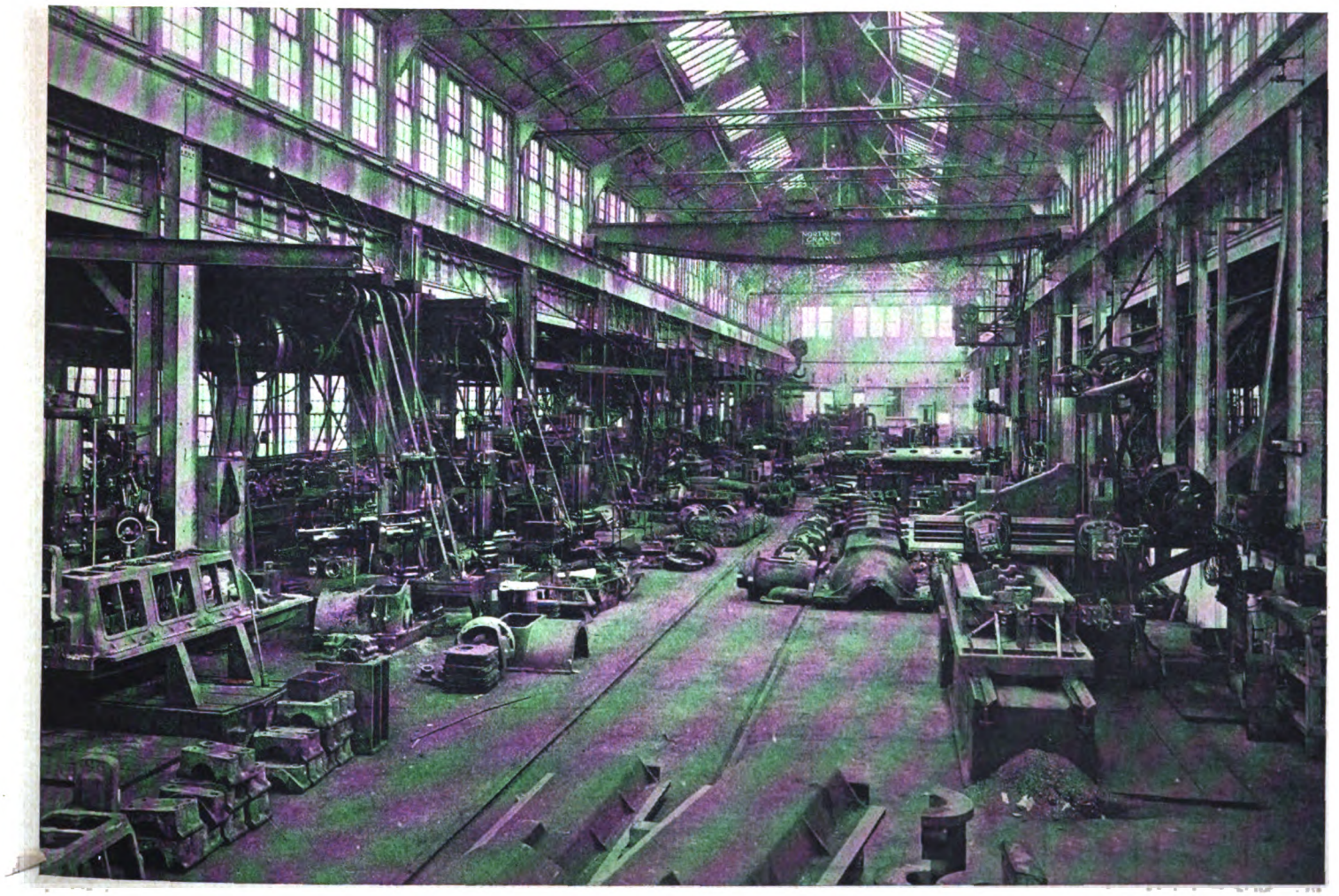


ASSEMBLY SECTION OF THE WINTON ENGINE WORKS



ONE OF THE MACHINE ENGINE WORKS

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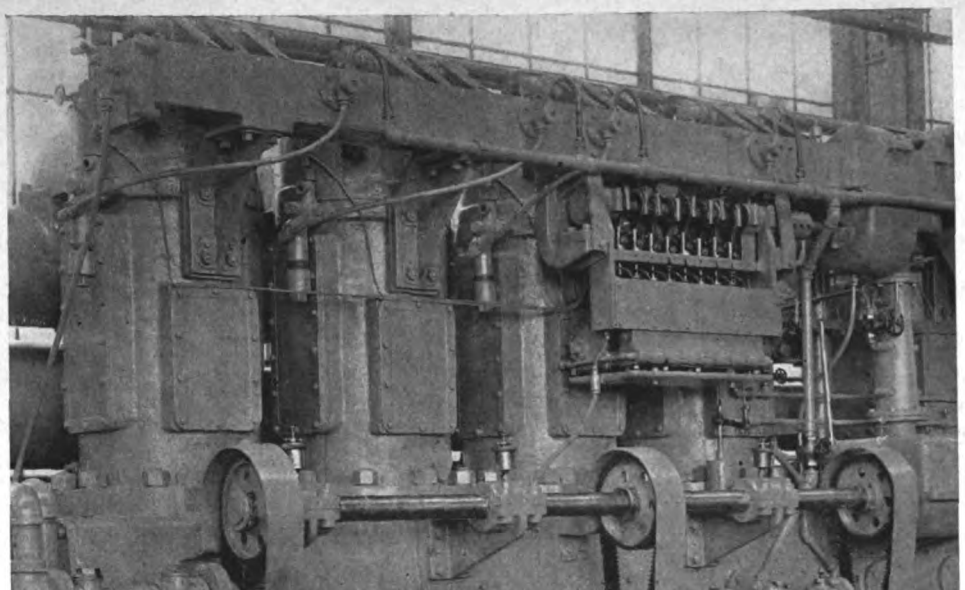


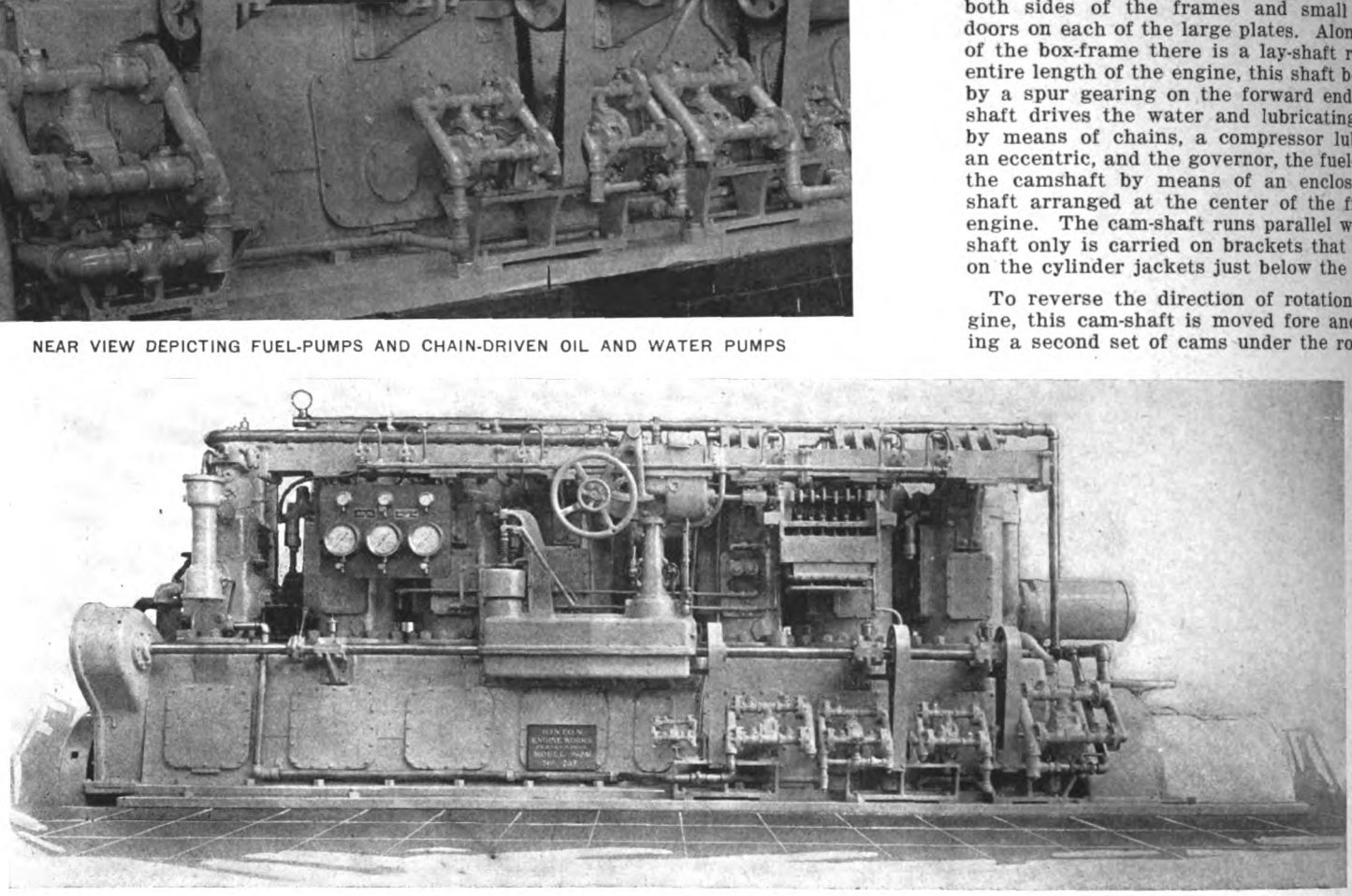
NEAR VIEW DEPICTING FUEL-PUMPS AND CHAIN-DRIVEN OIL AND WATER PUMPS

it was not bolted down to the shop floor, yet was entirely free from vibration or movement, showing the excellence of its balance.

This model, which we illustrate, is of the four-cycle, direct-reversible, single-acting class and from eight-cylinders, 12 15/16″ bore by 18″ stroke has a rated output of 500 brake h. p. at 250 r. p. m., although the maximum power that can be developed is over 600 b. h. p.; but, like most good Diesel builders, the Winton designers prefer to adopt a conservative rating, so they sell it as a 500 h. p. motor. Injection of fuel varies from 900 to 1,000 lbs. per square inch, according to the power being developed, and starting-air is used at 225 to 450 lbs. pressure. In the shop the engine has been reversed from full ahead to full astern in four seconds, which is quite fast enough for ordinary and special circumstances at sea.

The cylinders, cast separately, are carried on a box frame without any steel through-rods or columns, the crank-pit being entirely enclosed, although there are large detachable hand-plates on both sides of the frames and small inspection doors on each of the large plates. Along the front of the box-frame there is a lay-shaft running the entire length of the engine, this shaft being driven by a spur gearing on the forward end. This lay shaft drives the water and lubricating-oil pumps by means of chains, a compressor lubricator by an eccentric, and the governor, the fuel-pumps and the camshaft by means of an enclosed vertical shaft arranged at the center of the front of the engine. The cam-shaft runs parallel with this lay shaft only is carried on brackets that are carried on the cylinder jackets just below the heads.

To reverse the direction of rotation of the engine, this cam-shaft is moved fore and aft bringing a second set of cams under the rollers of the



MODEL 24 A, THE 350 B. H. P. SIZE WINTON MOTOR

the existing delays in the delivery of much of the steam machinery ordered for existing vessels.

The vast number of Diesel engines completed by, or on order at, the Winton Works, indicates in a remarkable way the vast market for this type of internal-combustion engine, and bears out our belief that before long the United States will be the greatest motorship building and owning country in the world.

This firm alone have completed and under construction the following oil engines:

Twelve pairs of 200 b. h. p. six cylinder machines.

Twelve pairs of 200 b. h. p. six cylinder machines.

Twelve pairs of 500 b. h. p. eight cylinder machines, as well as one pair of 1000 h. p. 12 cylinder V type engines for destroyer yacht, making a total of 26,000 b. h. p.

A great many of these engines are now in the Pacific trade. Some in the Atlantic trade, and they are being built at the rate of from two to four pairs per month.

All this has been done without any suggestion of financial interest or assistance from the Government and is purely the natural result of sound business enterprise, and demonstrates in a substantial way the bright future before American marine oil-engine builders, provided the Federal shipping authorities properly recognize the arrival of the motor driven ship—near future construction being in their hands.

We were fortunate in seeing a five-hundred horse-power Winton-Diesel engine running on the test-block. Incidentally we may mention that, although this motor was coupled to a water-brake,

A 1,000 B. H. P. TWIN-SCREW WINTON-DIESEL SET CONSISTING OF TWO 500 B. H. P. ENGINES

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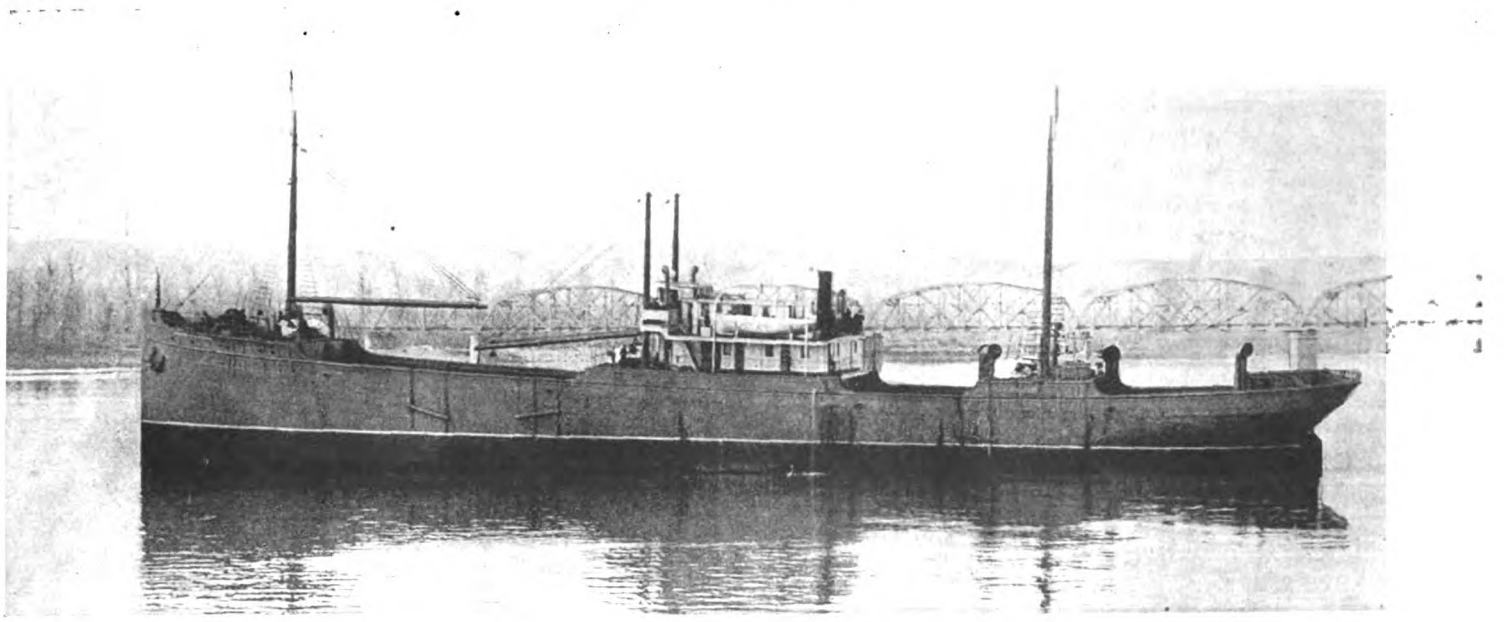

MOTORSHIP "JAMES TIMPSON"

Built by the G. M. Standifer Construction Co., of Portland, Ore. Powered with two 500 b. h. p. Winton Diesel engines. 1,700 tons d. w. c. Designed by Cox & Stevens for the owners, the I. T. Williams Company, hardwood importers of New York City

valve-rockers, the sliding motion being effected by means of a simple ratchet actuated by the control-wheel. The valve rockers, it will be noticed, are directly actuated off the cams without any intermediate push-rods.

At the forward end is the air-compressor, which furnishes air for starting, and for the injection of fuel. It is in three stages, mounted one above the other, with a stepped-type piston and has its intercooler mounted alongside. The water and lubricating oil pumps are of a novel type, specially designed by the Winton Works in conjunction with the Schirmer Frensdorf Co. of Cleveland and is known as the Viking reversible rotary pump. When the engine is reversed, the pump is reversed simultaneously; but, the direction of the flow of the liquid remains unchanged, which is quite an important feature, especially as oils, fresh-water or sea-water can be handled with a high average mechanical efficiency, a pump with a 2" outlet having a pumping capacity of 100 gallons per minute at 400 r. p. m. the speed being faster than that of the engine. A-1¼" outlet has a capacity of 35 gallons at 450 r. p. m.

The feature of reversing without changing the direction of the flow is worthy of description. Briefly, this is accomplished by means of four simple swing check valves enclosed in a chamber, containing the necessary passage-ways for the liquid being pumped. The pump ports are vertical and parallel and the valve chamber is bolted to the flanges on the outlet ports of the pump proper. One or two suction or discharge lines can be used as desired as there are four outlets from the valve chamber. The pump is very easily bolted to any part of the engine or base and can be gear or silent chain driven. The piping system thus is greatly simplified.

The pump casing contains suction and discharge ports, and, fitting closely inside the casing, is a large annular gear, the shaft of which extends through the casing and carries the pinion driven by the chain off the lay-shaft on the engine. There is a small gear wheel which rotates on a steel stud in the head of the pump eccentrically to the large annular gear in which it fits. The two gears consequently intermesh at a point in the casing between the ports and then forms an absolute barrier, so that the fluid is drawn in by suction and held in the open spaces between the cogs of both wheels. As the gears turn the fluid cannot follow the wheel any farther, but is forced out of the discharge port. As the wheels can revolve in either direction either port can be used for motion. As we have mentioned, these pumps are used both for lubricating and for water circulation on the Winton-Diesel engine.

STEEL MOTORSHIP BUILDING PROFITS.

Over Nineteen Million Guilders Profit Made in Three Years by One Company.

Like many other neutral shipbuilding companies, Burmeister & Wain, of Copenhagen, Denmark, have been faced with a shortage of material and with greatly increased cost of such materials as they have obtained; yet their profits have been very good.

They have entirely given up steamship construction and now exclusively build Diesel motorships, and are completely booked up for eight years ahead. Their latest order is for ten steel motorships of 2,500 tons D. W. C. each from the Danish Ministry of Commerce.

Their recent net profits have been as follows:

	Guilders	Dividends
1915	3,912,334	(No record available)
1916	9,015,384	25%
1917	6,674,279	22%

It is obvious from the above figures that the shortage of material was most felt by them last year.

150 DIESEL-DRIVEN MOTORSHIPS.

We are authorized by the E. I. Du Pont de Nemours & Co. to state that they have no connection with the proposal to build 150 Diesel-driven auxiliary motorships, for which permission was given by Chairman Hurley of the Shipping Board at the request of Senator Chas. L. McNary of Oregon. Neither did they know anything about the proposed building of these vessels. Further we are in no position to state that the building of these ships has any connection with W. R. Grace & Co. or with the Atlantic & Pacific Steamship Co., in which Messrs. W. R. Grace are interested. All of these companies have been besieged with inquiries, and thereby caused considerable inconvenience in these busy times.

LOW INSURANCE FOR AUXILIARIES.

British marine insurance companies are accepting low rates of insurance on American-built oil-engined wooden auxiliary cargo-ships.

THE SCHNEIDER MERCANTILE DIESEL ENGINE.

Among the most recent of marine Diesel engines designed by Schneider et Cie, (the great French engineering company who built the famous 75 centimeter gun used by our troops in France, and which the U. S. War Department has adopted and is building), is a large merchant-ship type of motor.

This engine is of the direct-reversible, two-cycle type, with six cylinders 540 mm. bore (21½ in.) by 800 mm. stroke (31½ in.) and develops 1500 to 1800 shaft h. p. (equivalent to about 2200 steam i. h. p.) at 140 to 150 r. p. m. Its guaranteed consumption of fuel-oil is 225 grammes per brake h. p. hour (or 7.937 ounces) and the consumption of lubricating-oil is 8 grammes. For cooling 40 litres of sea-water is required per b. h. p. hour. The complete weight, with auxiliaries, of this engine is 200 metric tons.

SPANISH DIESEL ENGINES.

Three marine Diesel engines of 420 b. h. p., and of the direct-reversible two-cycle type now are under construction at the Zorroza works of the Sociedat Espanola de Construcciones Metalicas, of Madrid. They are building under Sulzer license, and shortly will be laying down some more motorships. Previously this Spanish concern built marine steam-engines and steamships. Like many other shipbuilders, they have become subscribers to "Motorship."

WOMEN AS MARINE-ENGINE MACHINISTS.

Out of 105 machine-tools in the marine engineering shop of McKie & Baxter, Gowan, Scotland, no fewer than 53 are operated by women and girls. To every four to six machines, there is one skilled male supervisor. Even expert surface-table work is skillfully accomplished by women, and some of the girls have become so expert in machine-tool operation that the assistance of the supervisor for making adjustments is almost dispensable. They have 500 employees at these works, of which nearly 100 are female. The output of marine engines is 40,000 i. h. p. per year and the works cover 15,000 square yards.

TRIALS OF ANOTHER SUBMARINE ENGINE

Remarkable Number of Marine Diesel Engines Now Building by One Company.

In the January issue of "Motorship" an illustration and some details were given of the new Tosi four-cycle type 400-500 b. h. p. submarine-type Diesel engine, which was specially noteworthy by reason of its various pumps being driven by electric-motors mounted directly on the engine. At that time we did not mention that these pumps can be operated independently of the engine if desired, so that they will run when the engine is at rest, when necessary.

We now are enabled to give a few details of a severe test made with a six-cylinder engine of this design, but of 350 b. h. p. This test was of 120 hour's uninterrupted duration followed by 1 hour's running at overload. The long run was divided, without stopping, into 30 hours at full-load and 90 hours at three-quarter load, as follows:

120-Hour Trial of Submarine Diesel Engine.

Fuel load test—
Period of non-stop run, 30 hours.
Horsepower developed, 350 b. h. p.
Mean speed, 425 r. p. m.
Fuel-consumption per b. h. p. hour, 0.400 lbs. (179 grs.).
Lub. consumption per b. h. p. hour, 0.018 lb. (8 grs.).
Three-quarter load test—
Period of non-stop run, 90 hours.
Horsepower developed, 265 b. h. p.
Mean speed, 385 r. p. m.
Fuel-consumption per b. h. p. hour, 0.4221 lb. (188 grs.).
Overload test—
Period of non-stop run, 1 hour.
Horsepower developed (mean), 400 b. h. p.
Maximum power for a few minutes, 425 b. h. p.

The Franco Tosi Company have a very large number of marine four-cycle type Diesel engines under construction and on order or recently completed at their Legnano works. Altogether, there are 36 marine Diesel engines of 18,560 total shaft h. p. on the list before us.

MORE ITALIAN NAVAL MOTOR VESSELS.

The Diesel-driven vessels recently referred to as having been launched by the Societa Exercizio Bacini of Genoa, Italy, were built for the Italian Royal Navy.

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MOTORSHIP

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CONCRETE SHIPS.

When War Needs, Man Must Do!

WITH the recent launching of the S. S. "Faith" at San Francisco, possibilities of a new era in war-emergency hull construction automatically presented themselves, with the likelihood of the establishment of a permanent concrete shipbuilding industry. The exigencies of this great war have been the direct means of some remarkable experiments and developments in engineering; and, in most instances the greatest risks taken have produced the biggest successes, demonstrating the old axiom that "Necessity is the Mother of Invention." Perhaps we can suggest a more modern version of that contention and say—"When War Needs, Man Must Do!"

But, courage of conviction must accompany all experiments, and a typical instance is shown by this concrete ship built on the Pacific Coast, where the confidence of the builders is best displayed in the simple name they gave her. Much perhaps is conveyed in that word "Faith!" Even if this first large concrete vessel eventually does not turn out to be the complete success expected, we hope that the builders and backers will continue with their faith and carry on the construction of other ships—the war demands this—into which they can embody the experiences gained from the discovery of the weaknesses of the first—for, there must be faults with the initial ship! It was the same with motorships!

At the same time, we would rather they had been a little more modest with their first attempt and to have built instead, two ships of about 3,000 tons d. w. c. each; because, if the "Faith" does prove a disappointment, there is bound to be strong opposition to the construction of further ships in view of the large amount of money involved for one hull. Such opposition may prove a bar to continuance of large concrete shipbuilding, which indeed would be regretable.

One point that does not yet seem to have been raised, although we ourselves have pointed out the same to some of the concrete people, is that in certain services, such as the transatlantic route, the ships will be going east or west for fifteen or more days at a stretch. Each day, under certain climatic conditions, the hulls will have the cold winds, and no warm sun rays on one side, and the hot sun on the other side. The sun rays sometimes will make the metal of a steel ship almost too hot to rest the naked hand on it. This means that one side of the ship will contract, while the other expands, and the entire section under water remains practically neutral. Of course, the larger the hull, the greater will be the differences of expansion and contraction. To counteract this effect a steel-ship will warp slightly; but, can a concrete ship warp without cracking, or will the concrete ship not expand, but the steel within it expand and crack the concrete. For, expansion is a force absolutely nothing can hold! Or will the stresses set up be too proportionately-negligible to have any serious effect. Probably the answers are only to be given by actual experiences in service. However, at this stage, the whole subject of concrete ships is more or less a gamble necessitated by the results of the ruthless Hun submarine deviltry, so no discredit whatever should be placed upon the builders of the "Faith" if this does occur. Even if all have to be "scrapped" in three years, what matters? They will have done their work!

To our mind an ideal fleet of concrete ships would be a large number of motor-driven vessels of 2,000 tons loaded-displacement each, as such could be built rapidly in small yards, and the oil-engine machinery could be constructed without interfering with the completion of steam machinery of the present program of the Emergency Fleet Corporation. Comparatively small crews would be needed, and the engines would use but a minute amount of fuel-oil; yet, a substantial amount of cargo could be carried each voyage; but, the loss in bottoms every time a vessel was torpedoed would not be serious. Furthermore, the absence of coal-smoke will render such freighters less liable to submarine attack.

Diesel-driven vessels of this size will carry a 1,000 tons of actual cargo (not including fuel and water) if of 8½ knots average sea-speed or about 900 tons if of 10 knots speed, the powers required being 500 b. h. p. (600 steam i. h. p.) and 1,000 b. h. p. (1,200 steam i. h. p.) respectively. Single-screw propulsion would be best for the lower power, and single or twin propellers for the higher power, the propellers in each case turning at from 150 to 175 revolutions per minute. Not only could Diesel crude-oil engines be used for such ships; but, heavy-oil engines of the surface-ignition type doubtless could be advantageously installed, although the cargo-capacities of the ships would be a little less, because of the difference of about 10% to 15% in the fuel consumption.

Making these ships mastless and funnelless, would render them of very low visibility, particularly when loaded, as they would be smokeless, all auxiliaries, of course, to be electrically operated. Thus, as we mentioned above, they would be less liable to submarine attack.

Although we have no hesitation in admitting that coal-burning, or oil-fired concrete steamships of this displacement tonnage absolutely would be impractical for transatlantic traffic (because they would have to carry almost as much fuel as cargo) we believe that the foregoing is one of the most practical proposals to solve the shipping problem made since the war.

These vessels if of 8½ knots average sea-speed will only burn about 14 barrels of heavy-oil fuel per 24 hours; or about 28 barrels if of 10 knots loaded speed.

Furthermore, it would be possible, if a quick start be made, to have a hundred such motorships in service before many of the steel steamers now on order are afloat. So, if the "Faith" makes good, it is up to the Government's shipbuilding officials either to demonstrate the weaknesses (if any) of our proposal, or to promptly set about constructing such a fleet. Other recommendations made by "Motorship" during the war have been most valuable and practical, and this, we believe, will not be the least, or last, of them. **Non sibi, sed patriae!**

On April 9th, Chairman E. N. Hurley, of the U. S. Shipping Board asked the treasury for an appropriation of a fund of $50,000,000 for the purpose of developing and constructing concrete ships on a larger scale than the Emergency Fleet Corporation deemed advisable without explicit authorization from Congress. It is expected that the fund will be established without delay, and that $15,000,000 will be appropriated immediately. With such a large amount of money at the corporation's disposal, numbers of concrete motorships should soon be afloat. Let us once more repeat—"When war needs, man must do!"

THE U. S. NAVY OF TODAY.

The Work of the Submarine Patrol Boats.

ACCORDING to the "Official Bulletin" of April 9th, 1918, there were building or authorized for the U. S. Navy last year 123 vessels, as follows:

Battleships	15
Battle cruisers	6
Scout cruisers	7
Destroyers	27
Submarines	61
Fuel ships	2
Supply ship	1
Transport	1
Gunboat	1
Ammunition ship	1
Hospital ship	1

Since the above date, contracts have been placed for 949 vessels, including 100 submarine "chasers" for the navy or one of the co-belligerent nations. In addition more than 50 vessels have been turned over to the Navy by other Government departments.

In addition to the preparation of designs for the new destroyers, submarine "chasers," and mine sweepers, the Bureau has prepared designs for various other types of vessels. The most important part of this new design work has been in connection with the 200-foot patrol vessels, for which preliminary designs, contract plans, and specifications have been prepared, since December 26, 1917. Contracts have been let for the rapid construction of a large number of these vessels.

Included in the building program of the bureau are between 800 and 900 small boats, and both at navy yards and at private yards small-boat work is proceeding.

The Navy Department had prepared a design for a submarine "chaser" before the outbreak of the war. The ideal design for this purpose would obviously have been a vessel of armament, speed, sea-worthiness, and cruising radius closely approaching the characteristics of a modern destroyer. It was equally obvious, however, that vessels of this type could not be quickly built in large numbers, because of the limited capacity of the country for steel-ship construction, and for producing propelling machinery for the power and type needed. As it was considered desirable to conserve the capacity for steel-hull construction to the building of destroyers and cargo vessels, a wood-hull construction was adopted for the submarine-"chaser" program, so as to take advantage of the yacht and boat-building industry.

It was found also that there was no possibility of obtaining steam power-plants for these boats in the large numbers needed in the short space of time. An entirely satisfactory design of submarine "chaser" was prepared, having a length of 110 feet and driven by three 220-horse-power gasoline engines. Of these boats several hundred were contracted for during the middle of April, 1917, and practically all of these boats have been delivered. The boats have given splendid service, and have proved even more seaworthy than was anticipated, although seaworthiness was the principal design consideration. Many of these boats have crossed the Atlantic ocean in weather which has done considerable damage to accompanying larger ships. These boats have proved their undoubted superiority to any other type of boat built of wood for this purpose.

Our new battle-cruisers of 35,000 tons and 35 knots will be the fastest in the world, having a speed equal to the latest and fastest destroyers. They will also be the largest in the world, with the sole exception of the four British battle-cruisers of the "Hood" class, which are 41,200 tons displacement.

Speaking at Chicago on April 10th, Secretary-of-the-Navy Josephus Daniels said that since April 6th, 1917, the day on which war was declared, no fewer than 1,275 craft aggregating 1,055,116 tons had been added to the U. S. Navy. Of smaller craft, now building, (vessels from 65 to 1,215 tons displacement each) there are 794 with an aggregate tonnage of 420,217 tons displacement. Aboard ships in service in European waters are 36,000 men. (These include many Diesel-driven submarines.—Editor).

COMPARATIVE IMMUNITY OF MOTORSHIPS FROM SUBMARINE ATTACK.

As we previously have mentioned, the advantages of low visibility afforded by the funnelless, mastless, and smokeless motorships do not seem to have been fully realized by Washington in the past, otherwise the hundreds of Ferris-type wooden ships never would have been equipped with coal-burning steam machinery It is the line of smoke that betrays the presence of a vessel over the horizon to the lurking U-boat, and it is the stack and masts which even camouflaging cannot hide from the submarine when nearby, but when just too far away to be heard by the sound-detectors.

Could any better demonstration of this be offered than by the ships of the Atlantic Transport Line. One by one the steamers "Minneapolis," "Minnehaha," "Minnewonka" and "Minnetonka" have been torpedoed and sunk, but the big Diesel-driven motorship "Mississippi" still carries on with her valuable work, although she is an old-timer, built in the early days of big motorships, when such craft were more or less experiments.

The motorship "Mississippi" was attacked by a submarine in the first stages of the war; but, by reason of the great emergency reserve power of her Diesel engines (about 40%) she was enabled to increase her speed to several knots over her ordinary best speed, and so successfully ran away from the U-boat.

FOUR NEW OIL-ENGINED FISHING-VESSELS.

The first of four oil-engined fishing vessels for Bellew & Squires has just run her trials on the Rappahannock River and a speed of 10 m. p. h. was attained. Their names are "Richmond," "Lancaster," "Swanson," and "Martin," and the builders are at Humphrey's Marine Railway Co., of Weems, Md. There, vessels replace the fishing steamers, commandeered by the Government for patrol work.

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The New York State Canal

A $3,000,000 Barge and Towboat Proposition Backed by the American Shipbuilding Company Interests

SPACE has prevented our previously dealing with an important proposal to place a large new fleet of barges and tugs on the New York State Canal by a $3,000,000.00 company, which is backed by interests connected with the American Shipbuilding Company, for the purpose of carrying freight between the Great Lakes and the East Coast ports.

This information was revealed before the U. S. Senate Committee on Commerce by the testimony of Mr. G. A. Tomlinson of the Superior Shipbuilding Co. and of the American Shipbuilding Co., which together have seven steel shipyards, namely, at Cleveland, Buffalo, Lorain, Detroit, Milwaukee, Chicago, and Superior.

A point of particular interest is that this company do not desire Government assistance, but have all the money necessary to carry on the work. We reproduce Mr. Tomlinson's testimony herewith:

Mr. Tomlinson: I am not seeking anything from the Government. My associates in my 25 ships thought there was a splendid opportunity to equip the Erie Barge Canal in part with steel barges. To that end I have already $3,000,000 subscribed to go ahead with that work.

We have consulted with the steel company,—the Lackawanna Steel Co., in Buffalo,—and made arrangements with them to fabricate material for those barges. We had secured land to assemble them in Buffalo, and were ready to go ahead after the Government had assured us, first, that they would not commandeer the vessels, and second, that they would not engage in a construction plan of their own and thus be in competition with us.

I was here last week in connection with some other matters and Secretary McAdoo requested me to call and see him the following day, which I did; and this matter was presented to him at that time by one of the officers of the War Department; and I gained the impression from what Secretary McAdoo said that it was quite likely that the Government would enter into the barge-construction plan on all of the inland waters. Of course, if the Government pursues that policy, we drop out.

Senator Nelson: But if the Government does not pursue that policy, you stand ready to go ahead, or your company does?

Mr. Tomlinson: Yes, sir.

Senator Nelson: And you can construct these 100 barges?

Mr. Tomlinson: We can start to build 100 barges;—we can not get them all out in one year.

Senator Nelson: How many can you get ready for the next crop movement?

Mr. Tomlinson: I think we could get probably 30 or 40 of them.

Senator Nelson: What sized vessels?

Mr. Tomlinson: About 650 tons. It is a very simple matter to build those barges.

Senator Nelson: That is the size that Mr. Williams, the State Engineer, said was the proper size.

The Chairman: What draft will these vessels be?

Mr. Tomlinson: The State of New York will only permit a draft of 9½ feet at first; ultimately, 10 feet. I am speaking of boats having 9½ feet draft now.

The Chairman: Those boats will have to be towed, will they not? They are not self-propelling?

Mr. Tomlinson: Both plans have been considsidered. We propose to have a ————————

Senator Ransdell: How many tons will that tow and the three barges carry?

Mr. Tomlinson: Two thousand five hundred or 2600 tons.

The Chairman: Do you mean then, that you are prepared to go ahead and build these barges for your own account?

Mr. Tomlinson: Yes, sir; for our own account.

The Chairman: And with your own money?

Mr. Tomlinson: Yes, sir; with our own money.

The Chairman: And you are willing to do that —and ready to do it—so that the information that this committee has heretofore had, given by the State Engineer of New York, among others, to the effect that private capital could not be induced to go into that proposition is erroneous?

Mr. Tomlinson: Well, that is our situation exactly, Mr. Chairman. This is not a promotion scheme.

Senator Nelson: You do not ask bonus or any help of any kind from the Government?

Mr. Tomlinson: Yes, sir.

Senator Nelson: Your company has $3,000,000 subscribed, and you have made arrangements with the Lackawanna Steel Co., with Mr. Clarke, chairman of the Lackawanna Steel Co.; that is, the Government had agreed to release steel for us to purchase, for the construction of these barges.

Senator Ransdell: Would you contemplate moving a very large quantity of the grain from Buffalo to the seaboard that you are now moving from the Western end of Lake Superior to Buffalo?

Mr. Tomlinson: Naturally, that would be the principal commodity that we would carry.

Senator Ransdell: About how many tons of freight per annum would you contemplate carrying in your barges under your present plan? How many could you carry normally?

Mr. Tomlinson: Off hand, I should say perhaps 2,000,000 tons. That is not a careful statement, however.

Senator Ransdell: About 2,000,000 tons. And about how many tons normally would you consider a fair capacity of the Barge Canal?

Mr. Tomlinson: Gen. Witherspoon, Superintendent of Public Works of the State of New York, estimates the capacity of the canal as from 10,000,000 to 12,000,000 tons a year.

Senator Ransdell: So that you would carry something like 20 per cent of that?

Mr. Tomlinson: Please understand that I am speaking of that part of the canal which is between Albany and Buffalo.

Senator Nelson: Carrying grain from the Great Lakes down to the seaboard?

Mr. Tomlinson: Yes, sir.

Senator Ransdell: You would not depend on the railroad to get freight connection for your Erie Canal barges?

Mr. Tomlinson: There were 177,000,000 bushels of grain that came to Buffalo last year and were delivered in the elevators there. That is over 5,000,000 tons.

The Chairman: Can you tell the committee how the freight rates on the line you suggest, carried by barges on the canal, would compare with the railroad freight rate from Buffalo to New York?

Mr. Tomlinson: The average rail rate between Buffalo and New York is 6 mills per ton-mile. The cost of operating a barge under present conditions, I understand—I do not know this as a fact—but it is estimated by the officials of the State of New York at 2 mills per ton-mile.

Senator Ransdell: Under the present conditions?

Mr. Tomlinson: Under the present conditions.

Senator Ransdell: With those small barges?

Mr. Tomlinson: Yes, sir.

Senator Ransdell: With the 240-ton barges that they now use?

Mr. Tomlinson: Yes, sir.

Senator Ransdell: It would be much cheaper with the large barges of 650 tons, would it not?

Mr. Tomlinson: Yes, sir.

Senator Ransdell: So that it would make a very material saving in the freight charge, would it not?

Mr. Tomlinson: Yes, sir. I understand that the average canal rate now is 4.8 mills.

Senator Nelson: You do not mean, of course, that you would want to have the exclusive right to build barges and operate them on the Canal? You have no objection to private enterprise competing with you; it is only that you do not want to compete with the Government? Is that correct?

Mr. Tomlinson: Yes, sir. I am not afraid of the other fellow:

Senator Nelson: No; you are willing to stand your own against any other private interest, and will welcome the opportunity?

Mr. Tomlinson: Yes, sir.

Senator Ransdell: As a matter of fact, you expect other companies to go into this proposition, do you not?

Mr. Tomlinson: Yes, sir.

Senator Ransdell: If you lead the way, you expect other people to follow, do you not?

Mr. Tomlinson: Yes, I think so. I should expect that ultimately they would put 15,000,000 tons capacity on there.

Senator Nelson: And the capacity of the canal would be about 400 barges, you say?

Mr. Tomlinson: That would be a rather low estimate of the number, because there is more or less delay in the handling of freight; the more barges you have on the canal, naturally, the more congestion there will be.

Senator Nelson: Yes.

Senator Ransdell: If I understand you correctly, Mr. Tomlinson, your company is practically organized, and the money already subscribed to the extent of $3,000,000?

Mr. Tomlinson: Yes, sir.

Senator Ransdell: And you are ready to begin building boats at once?

Mr. Tomlinson: Yes, sir.

Senator Ransdell: And all you want to be assured of is that when you build the boats and start the enterprise the Government will not itself enter into competition with you?

Mr. Tomlinson: Yes, sir.

Senator Ransdell: As the Governnment can afford to operate at a loss, and you cannot?

Mr. Tomlinson: That is the idea, sir.

Senator Nelson: And the Government can afford to build at a loss, also?

Senator Ransdell: And if the Government does not go in, and you are allowed to go in, you will put those boats on as promptly as possible, and will begin to operate 30 or 40 this year?

Mr. Tomlinson: Yes, sir.

The Chairman: I should very much prefer depending on Mr. Tomlinson's building barges for use on that canal than to have the Government have to do it.

Senator Ransdell: So should I.

The Chairman: That would be a long step in the right direction.

Senator Nelson: Your company expects to operate those boats also when it builds them?

Mr. Tomlinson: Yes, sir. This company is composed of a number of grain merchants and other people who have freight to carry, and we can keep 100 of those boats going, carrying the grain east-bound.

Senator Ransdell: Of course, you expect to make a reasonable profit on your enterprise?

Mr. Tomlinson: I expect to make all I can.

Senator Ransdell: That is right.

Mr. Tomlinson: And I expect you gentlemen to see that I get part of it.

In view of the above, the taking over on April 17th, of the Erie & New York State Barge Canal by the Railroad Administration under orders from Director-General McAdoo is of especial interest. Together with this announcement comes the news that a fleet of barges be constructed immediately, and operated there under the direction of G. A. Tomlinson, to relieve freight traffic.

• This is the first inland waterway whose operation under the Railroad Administration has been definitely decided upon, as a result of the extensive investigation made by the Committee on Inland Waterways of the Railroad Administration. Within a few weeks however, the Director-General is expected to order several other canal systems and navigable rivers, including the Chesapeake and Ohio Canal, the Black Warrior River in Alabama and several Atlantic coast waterways used actively by the Railroad Administration, to relieve traffic on the rail lines. Construction of barges within two or three months, and their extensive use in the late summer and fall are planned. Investigation now is being made of the practicability of concrete barges, which it is said, can be built quickly and cheaply.

The barges will be of modern construction of the most improved type and will be operated in conjunction with and as a part of the general railroad and waterways transportation system of the country under the control of the Director-General of Railroads.

"G. A. Tomlinson of Duluth, Minn., a man of large practical experience in lake navigation, has been appointed General-Manager of the Erie Canal operations, including the construction of the barges and general equipment. Under Government control of the railroads and the canal there

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can be diverted to the canal all of the traffic that can be handled to the best advantage by water."

Several hundred steel barges of about 700 tons each will be ordered immediately from construction companies on the Great Lakes, and the first of these probably can be completed in five or six weeks. Each will cost about $60,000. Most of the old equipment will not be used to any great extent.

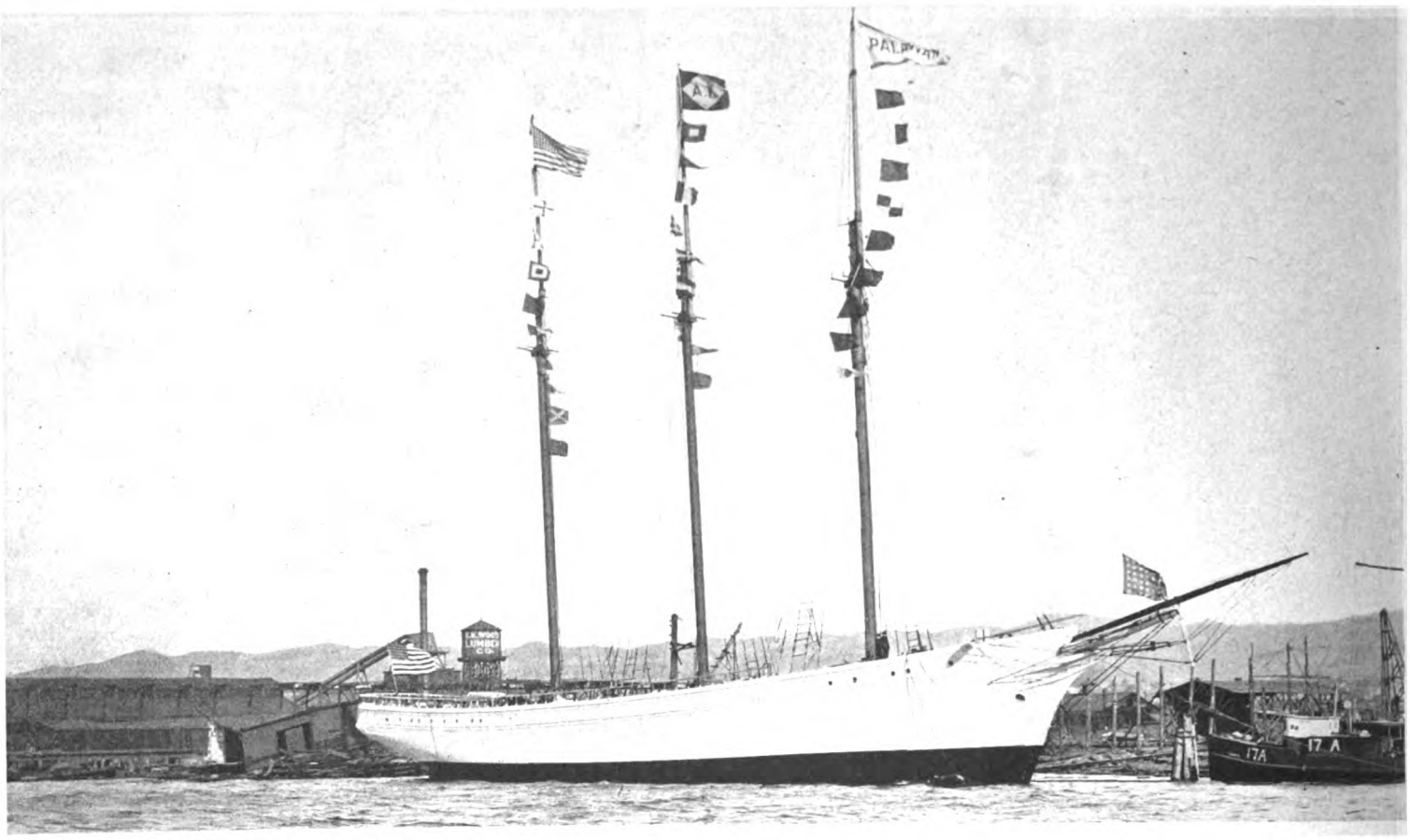
"The action of the Director-General meets with our heartiest approval," Governor Chas. Whitman stated. "It was really done at our request, and we will give the plan our entire co-operation."

The Governor made it clear that the Federal Government would simply have charge of the operation of the canal traffic, and that the canal property itself would remain in charge of General W. W. Wotherspoon, Superintendent of Public Works.

In view of the Government having taken over the Canal, and in view of the large fleet of barges to be built by private interests, we presume that little or no further action will be taken regarding the Sage bill which State Senator Henry M. Sage introduced at Albany. This bill proposed the $1,000,000 be spent to construct barges for the State Canal System.

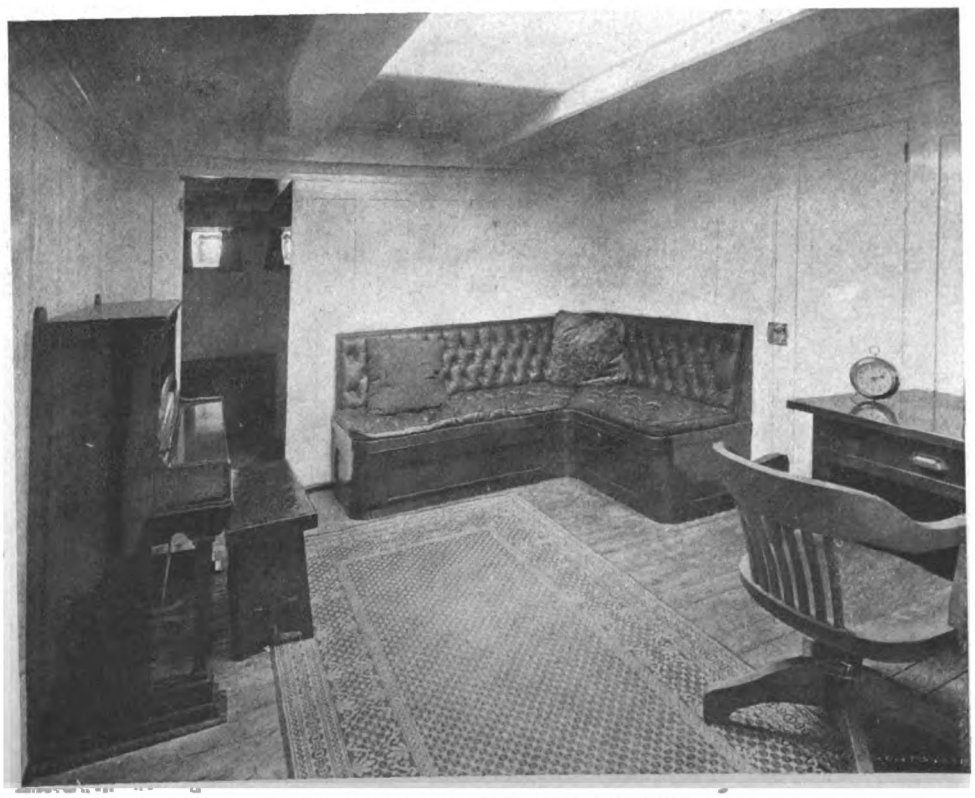
It is to be hoped that Mr. G. A. Tomlinson will thoroughly weigh the advantages of motor-barges and motor-driven tugs for this work, and thus start operations with an efficient and economical system.

The Motor Auxiliary "Palawan"



THE "PALAWAN"
POWERED WITH TWO 110 B. H. P. UNION ENGINES

SINCE the days of Captain Cook, the islands of the South Seas have furnished the setting for tales of romantic adventure, changing from early conflicts in which anthropophagical tribes encountered the whites, manning square riggers, to the more recent times when little fore-and-aft windjammers with nondescript crews, driven by "bucko" mates trafficked among the islands, bringing away their products, and carrying to them certain elements of civilization—only too often, elements of a useless or of a doubtful character, and of which the most desirable were trinkets and cheap baubles such as would appeal to the primitive mind, and of which the most detrimental were the very strong waters which revived the savage instincts of the natives.



SALOON OF THE "PALAWAN"

In the days of the early trading the native chiefs and the buccaneers were the chief factors, and though cheap the goods traded had still a real value, as they were the means of promoting in the minds of the natives a desire for the larger civilization. Real progress for civilization came under the organized influence of the various civilized governments; old tribal wars were ended, and the peaceful rule of the chiefs backed up by the white man's authority brought the productiveness of the islands under some systematic organization and on a somewhat commercial basis. Long years were, however, required, before a more organized and permanent form of conditions was brought on and which was due in the main to transportation difficulties. The ships in use depended on the winds and as a result long passages were the rule. The islands were separated from commercial centers by the zone of the Doldrums, where these little vessels were sometimes held up for months, waiting for a change in the wind.

The last few decades have brought on much more rapid progress due in the main to the introduction of vessels powered by other means of propulsion than wind. Steam helped some, but because of the expensive character of this class of machinery, necessity for carrying large amounts of fuel, and other difficulties arising in the use of steam vessels, most of these islands were still without any regular and dependable means of communication with the rest of the world, but with the introduction of gasoline motors, and later on the still more economical heavy oil motor, progress has been accelerated, and the terror of the zone of the Doldrums has been overcome.

Coincident with the suppression of tribal feuds the old semi-piratical trading methods were grad-

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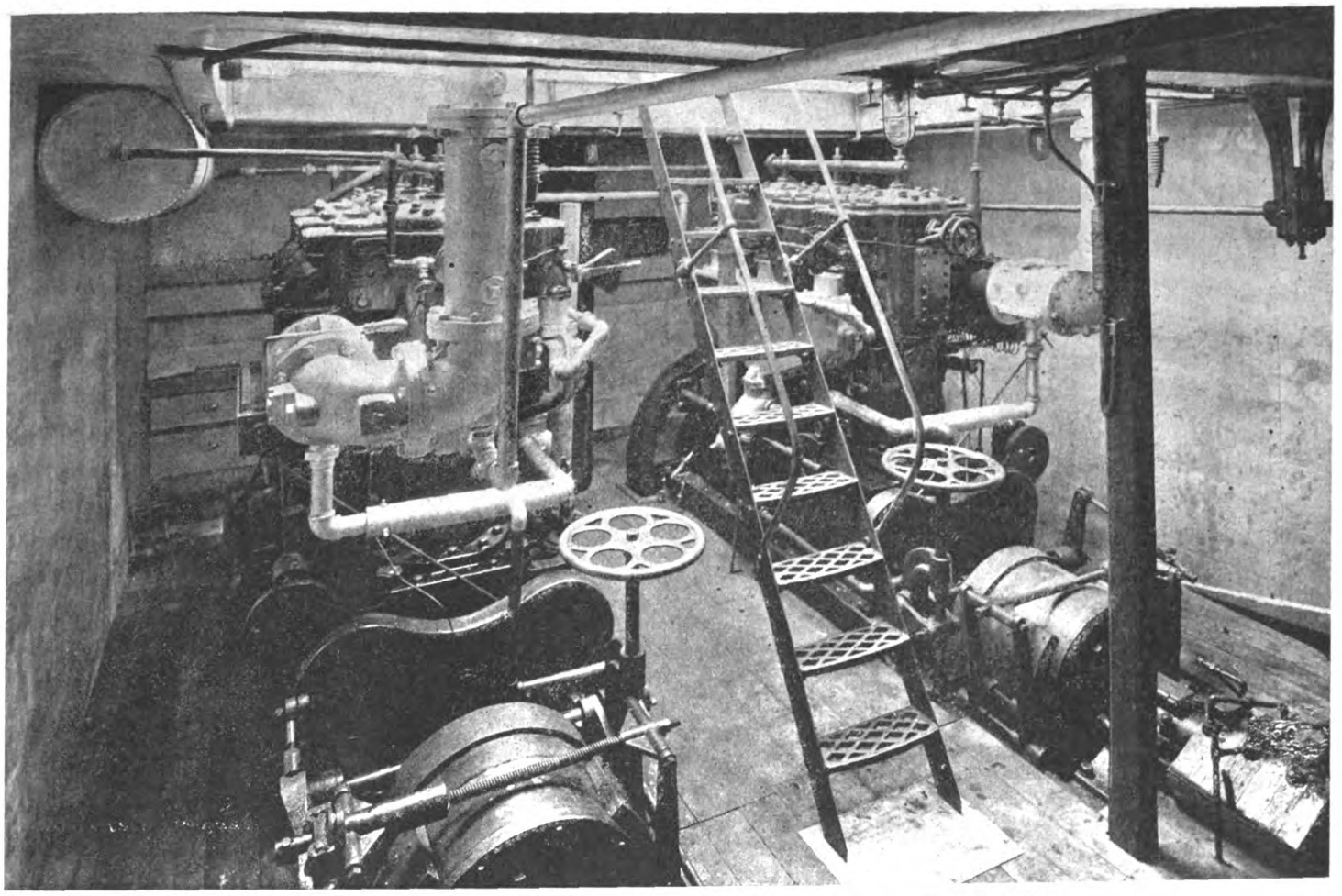
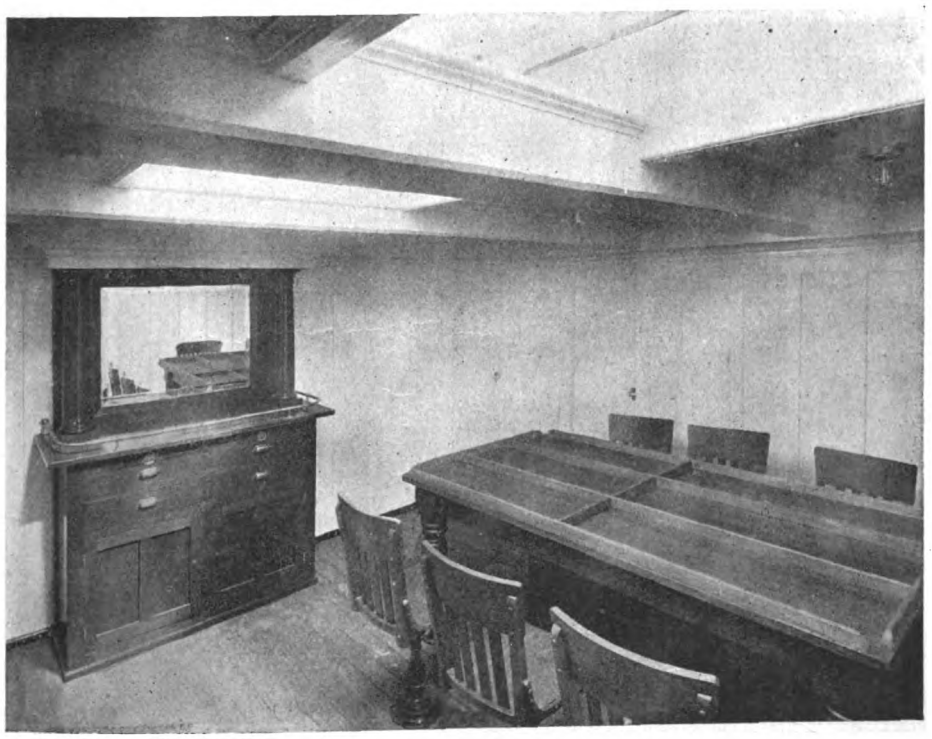


ENGINE ROOM OF THE "PALAWAN," SHOWING THE TWO 110 B. H. P. UNION MOTORS MANUFACTURED BY THE UNION GAS ENGINE COMPANY, OAKLAND, CAL.

ually abandoned and the resources of the islands were developed by wealthy trading organizations, operating under the supervision and with the approval of the governments of the countries controlling the islands.

The cheapening and simplification of transportation has brought also a change in the class of merchandise. The old-time speculative nature wherein rich treasure was the object aimed at by the adventurers has given way to matters of more prosaic and stable value, the principal one of which is copra, the dried meat of the cocoanut, which is valued for a great number of uses, as a food product, soap, etc. In return for this, instead of beads, baubles and fire-water, goods of a practical value to the natives, such as canned foods, small machines, etc. The dreams of great treasure have been largely dissipated, but the wealth in copra alone has proved to be well worth the time and effort necessary to bring it to the markets of the world. The trading is now done largely through owners of concessions on the islands, who also have headquarters in Australia and sales offices, in most cases, in San Francisco. The primitive trade-room has given place to the more dignified places of meeting for the factors in the trading, who are people, for the most part, who appreciate the value of contact with the outer world, and the old fleet of windjammers has been replaced by the more trim, yacht-like lines of the modern motor trading schooner. Many of these have been added in the last few years, the latest of which is the "Palawan," a three-masted schooner rigged auxiliary, launched recently by the Stone Shipyards in Oakland, for Atkins and Kroll of San Francisco, of which we show some very interesting illustrations.



OFFICERS' DINING ROOM OF THE "PALAWAN"

The "Palawan" is a 180-foot schooner, equipped with two 110 h. p. 4-cylinder Union heavy duty distillate engines, manufactured by the Union Gas Engine Company of Oakland, a number of which have been installed in vessels of this type engaged in similar service. An unusual feature of this engine is the type of reverse gear used. As there was not room aft of the engines for the installation of the usual reverse gear a shaft coupling was used on each shaft and a brake installed. When under sail the shafts are uncoupled and the propellers turn free without altering the vessel's speed. When the engines are to be used again the brakes are set and the propellers quickly stopped, and then recoupled. The auxiliary engine to run the pumps and lights is not needed when the main engines are running, as both the dynamo and pumps may be worked from an idle shaft, driven by a belt from one of the main engines.

THE GROWTH AND SUCCESS OF "MOTORSHIP."

That there is a sound, fundamental reason for "Motorship," and a vital need for its publication is completely demonstrated by the remarkable manner in which its subscription list is steadily growing. Among recent important subscriptions received is a personal one from Lord Pirrie, the controller-general of shipbuilding in Great Britain and Ireland. The Hon. Edward W. Hurley, chairman of the U. S. Shipping Board, is another regular reader. One unusual thing in connection with receiving subscriptions is that many of our subscribers very soon write for a complete set of back numbers of "Motorship."

We assure our readers that this reception is welcomed by our editorial staff and by the publishers who will endeavor to make each subsequent issue more valuable and interesting. "Motorship" now is of national and international importance, and its success as a marine journal is indisputable, although only two years have gone by since its first issue was published. Yet, the publishers have had a serious obstacle in the way of war, high prices, and interrupted communications, to face. But, despite these, "Motorship" has attained success.

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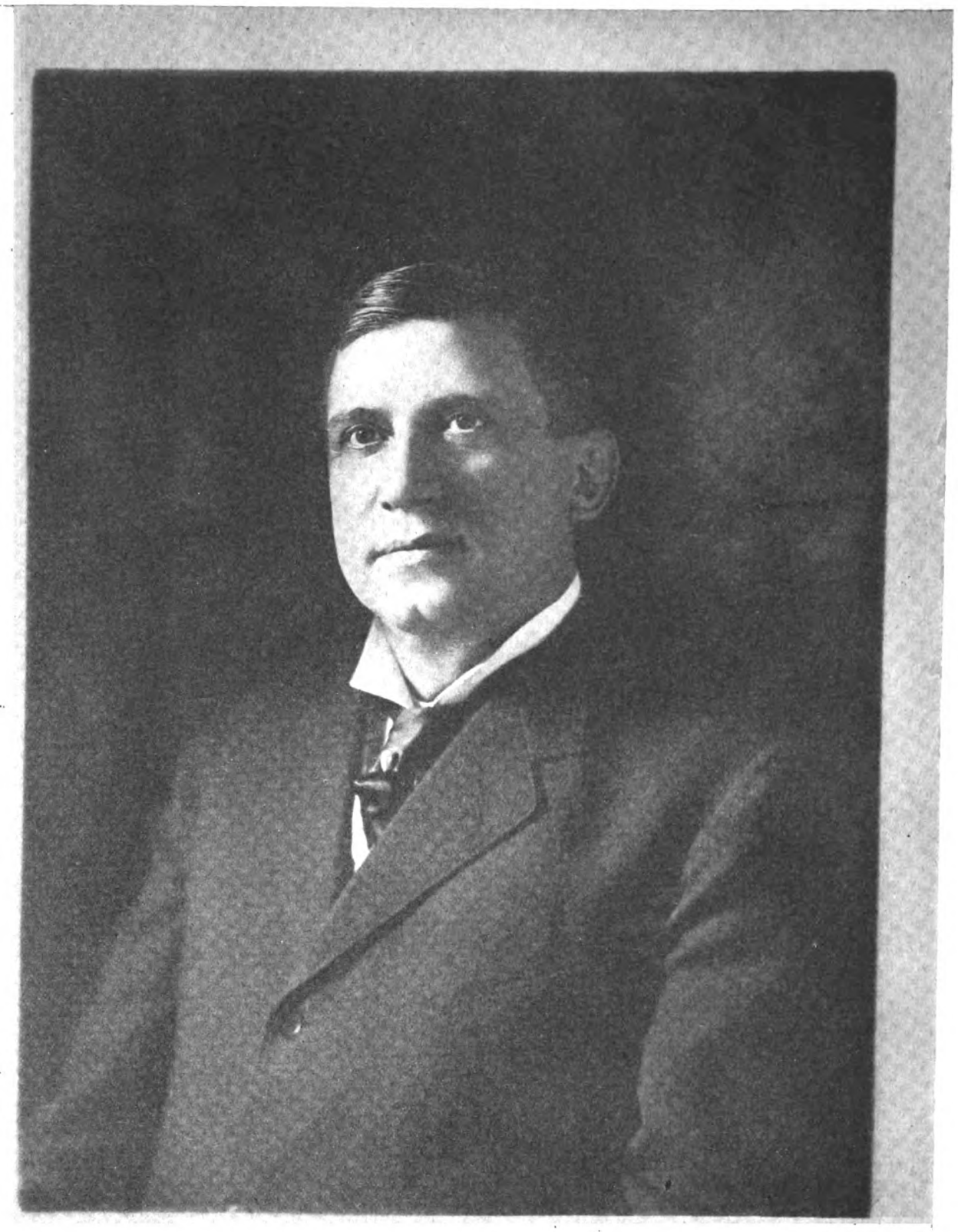
The New Director-General of the United States Emergency Fleet Corporation



CHARLES M. SCHWAB

THE building of the great merchant marine which will transport America's men and resources to Europe has been entrusted by the Shipping Board to Charles M. Schwab, with the official title of Director-General of the Emergency Fleet Corporation. Mr. Schwab's ability is too well known to require comment, and his success as an organizer and an executive is not to be questioned. As chairman of the Bethlehem Steel Corporation and allied concerns Mr. Schwab has had control of about one-third of the shipbuilding in the United States, and it is because of the need for a man of his experience and for a practical builder that he was chosen and practically drafted into the service.

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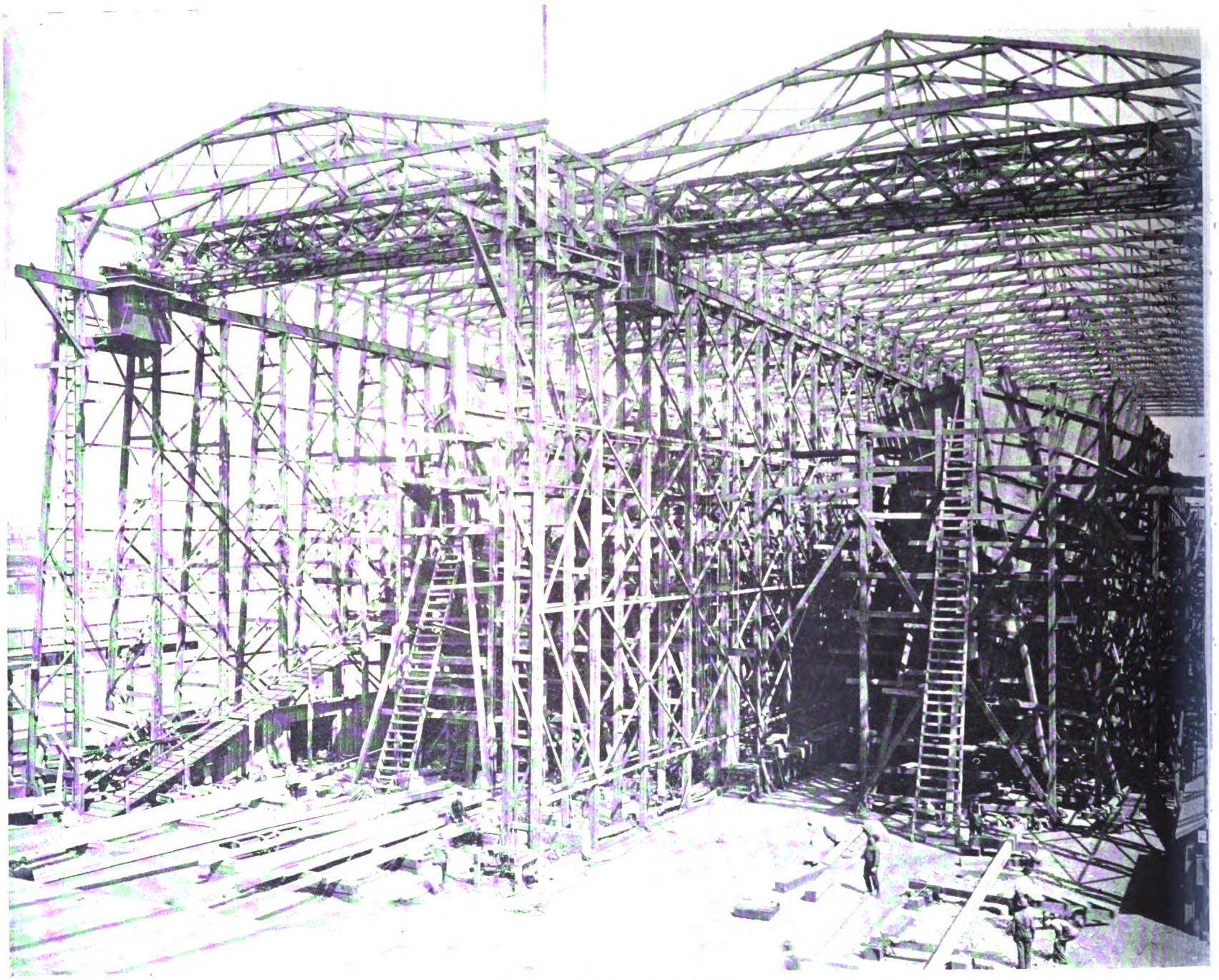


THE FIVE SHIPWAYS OF THE ELLIOTT BAY SHIPBUILDING COMPANY

A Large New Motorship Enterprise

Nine Full-Powered Wooden Motorships Now Being Built

EARLY in 1917 C. O. Morrow, who for a number of years owned and operated the Elliott Bay Yacht & Engine Company of Seattle, Wash., became convinced that the Puget Sound region would be called upon to give a very material aid to the government in the matter of building wooden ships. He was certain that ships would form America's first line of offense. With these ideas in mind he started investigations and to evolve plans for a thoroughly modern wooden shipbuilding plant. He was not the least disturbed by the advice and warnings of his many friends in the shipbuilding industry who strove to keep him from his "big idea." The result today is the Elliott Bay Shipbuilding Company, one of the largest and certainly one of the best equipped and arranged wooden shipbuilding plants in the country.

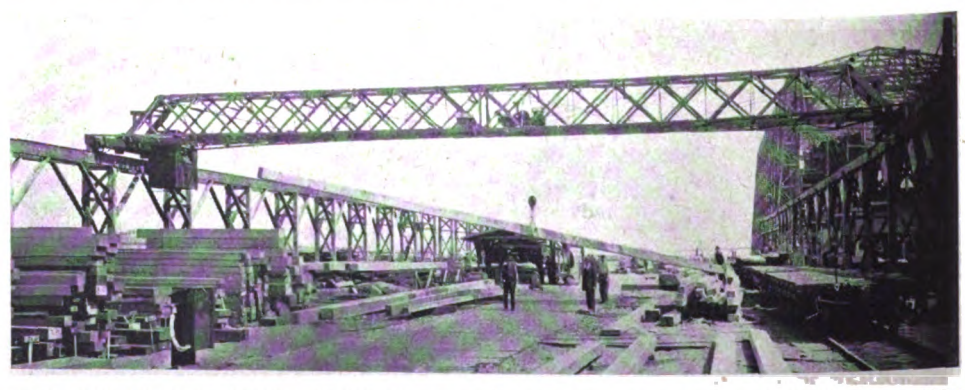
For many years Mr. Morrow had built wooden vessels of various types at his former location and it is due to the thorough knowledge that he had gained that he had not the least difficulty in obtaining the support and backing of men who had, as he, definite ideas at that time as to the part that wooden ships would play in the transportation problems of our country and of the Allies. An unlimited supply of capital was placed at his command. A company was formed of these men of which the following officers were elected; C. O. Morrow, president and general manager; C. A. Kilbourne, vice-president; E. L. Skeel, secretary; I. Seitzeck, treasurer. Contracts for nine full-powered motorships were obtained and the construction of the yard, the site for which had previously been obtained on the West Waterway, was commenced. On the fourth of July, 1917, nine of the fourteen acres comprising their holdings were under water. These were rapidly filled in and five shipways were laid, upon which at the time of writing five motorships are well on their way to completion.

In laying out the yards Mr. Morrow was not rushed, for it was his idea to build a real shipyard with everything as it should be so as to speed up the building of ships. He now has such a yard. The whole area of the yard has been planked, making for cleanliness and for the betterment of working conditions.

Every device which could be made or purchased for the rapid construction of ships was obtained.

Description of the Plant.

As has been mentioned, five shipways were laid over which were constructed five ship sheds 60'x80'x300' to shield the ships and the workmen from the rains in winter and from the sun in the summer, and also to act as supports for the system of aerial tramways which will be described later in this article. A modern mill was also con-



ONE OF THE LARGE ELECTRIC CRAINS AT WORK, CARRYING ONE OF THE LARGE TIMBERS TO BE USED IN THE CONSTRUCTION OF THE SHIPS

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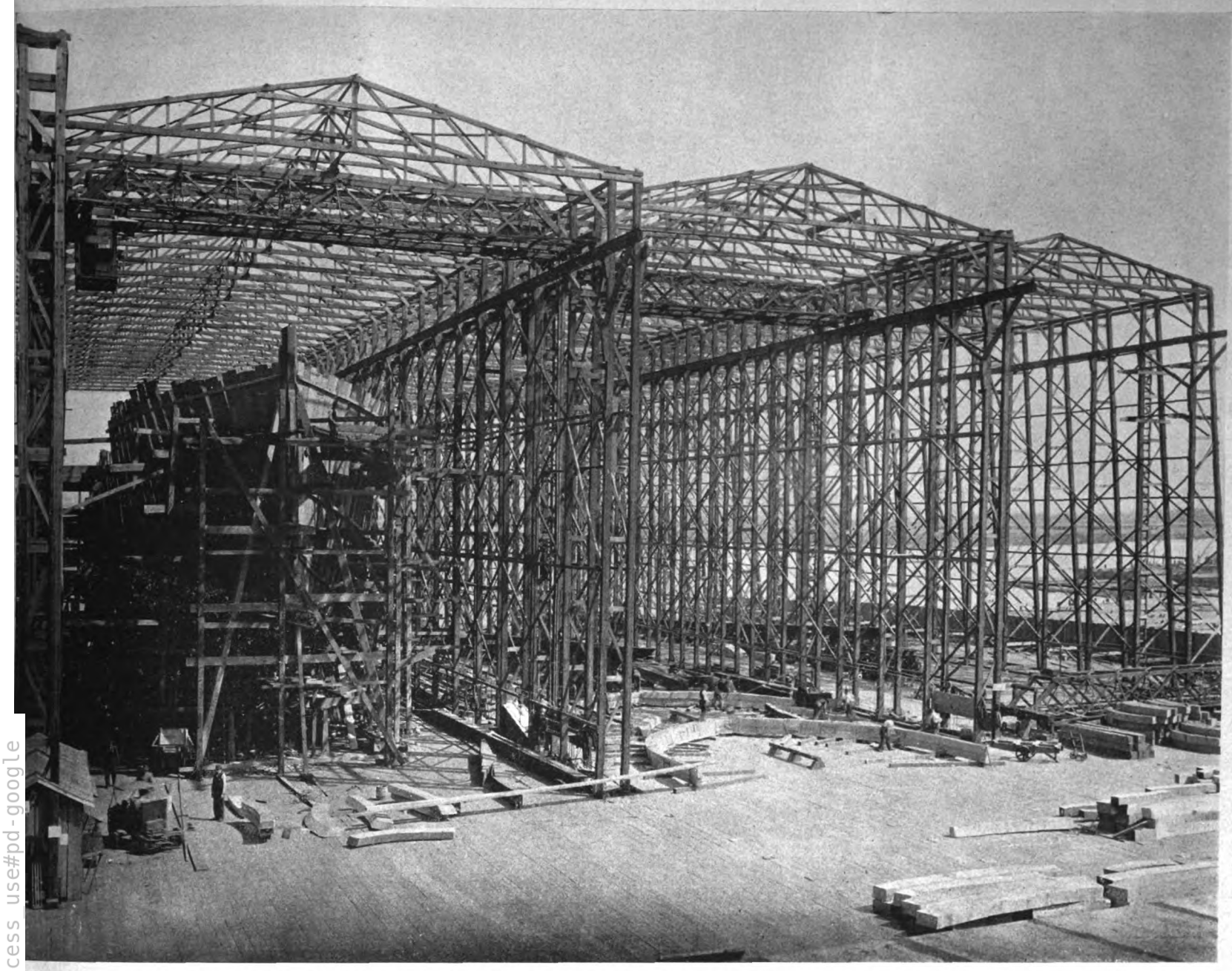

VE FULL-POWERED MOTORSHIPS IN THE COURSE OF CONSTRUCTION

ucted with a capacity for 100,000 feet of lum- a day—the amount required for the full opera- n of the yards. The main mill building which o includes the mold loft on the upper story l the joiner shop at the south end, is 50 feet le and 180 feet long. All the wood-working chinery is electrically driven. In the mill per are housed a large American band-saw and band-saws manufactured by L. Power & Com- y of Philadelphia, along with a 30″ jointer a 6″x24″ planer. The joiner shop houses the nnel machine made by the Trevor Mfg. Co., of kport, N. Y., and a trunnel pointer, a 6″x20″ ner for surfacing lumber, a rip saw, a 12″ joiner, small band-saw and a shaper. South of the l is the power plant made up of two parts, the pressor room, which houses the five Ingersoll- d compressors of 425 cub. feet, and the West- house electric generators supplying the power the yard, and the boiler room, which supplies steam for steaming the ship timbers. Along- e the mill and the power plant are the general re-room wherein is kept spare parts of prac- lly every tool or appliance in the yard, the cksmith shop and the oakum and salt sheds. machine shop is also in this block of build- s and is up-to-date in every way. A 50″ radial l manufactured by the Fosdick Machine & l Company of Cincinnati, a complete Davis- rnonville acetylene welding outfit, a 40″ Fay cott lathe, a 21″ Monarch Tool Co. lathe, drill sses, shapers and hack-saws are some of the s which make up the equipment of the ma- e shop, and it is with the aid of these tools the company makes practically all the new s and repairs needed in the yard. The minor s in ship construction will also be made in e shops, such as cargo winches, anchor wind- es and boilers all will be made here. Other wood-working machinery is located in the yard and consists of a large Stetson & Ross planer, which will handle timbers up to 85 feet long, 24 inches deep and 48 inches wide. In conjunction with this planer is a bevelling side-head (Stetson & Ross) for degree cutting and a large jig saw.

INTERIOR OF ONE OF THE SHIPS BEING BUILT. NOTE THE BOLT-DRIVER AND OTHER TOOLS IN THE FOREGROUND

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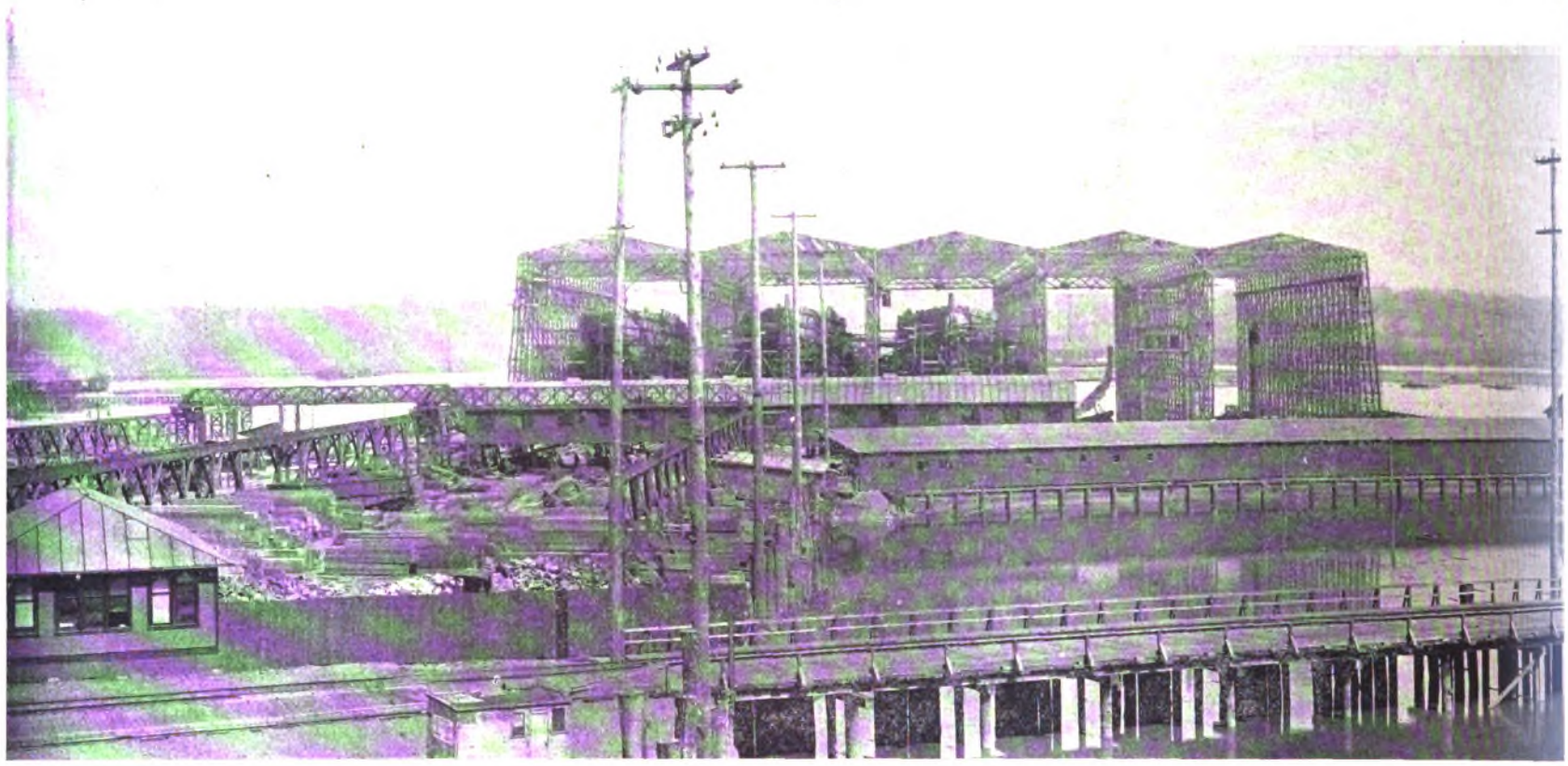


PANORAMA OF THE ELLIOTT BAY SHIPBUILDING COMPANY'S PLANT

The large timbers come into the yard either by rail (Northern Pacific) or scow, and are handled by a marvellously efficient set of cranes, four in number. Two of these cranes are operated directly over the tracks, unloading the timbers and placing them in their places as to sizes and also carrying them from the scow to the unloading platforms. The crane, which unloads from the scows, runs the entire length of the yard. The other two cranes lift and carry the timbers from the unloading platforms to the mill, where they are cut into their different sizes and shapes before going further into the construction of the ship. These cranes along with those which are operated over each shipway, were all designed and made in the yards of the company. Those handling the timbers in the yards are of five-ton capacity (10-ton tested) and those over the shipways of 10-ton capacity (tested for 20 tons), and have spans of approximately 100 feet. They are equipped with 30 h. p. motors split up so that the hoist is driven by a 15 h. p. motor, the bridge travel (10 h. p.) and the trolley travel (5 h. p.). The yard cranes will have a combined area covering the entire yard. The ship crane tracks are 70 feet above the ground and are so constructed as to handle in a very simple way the heaviest timbers placed in the ships.

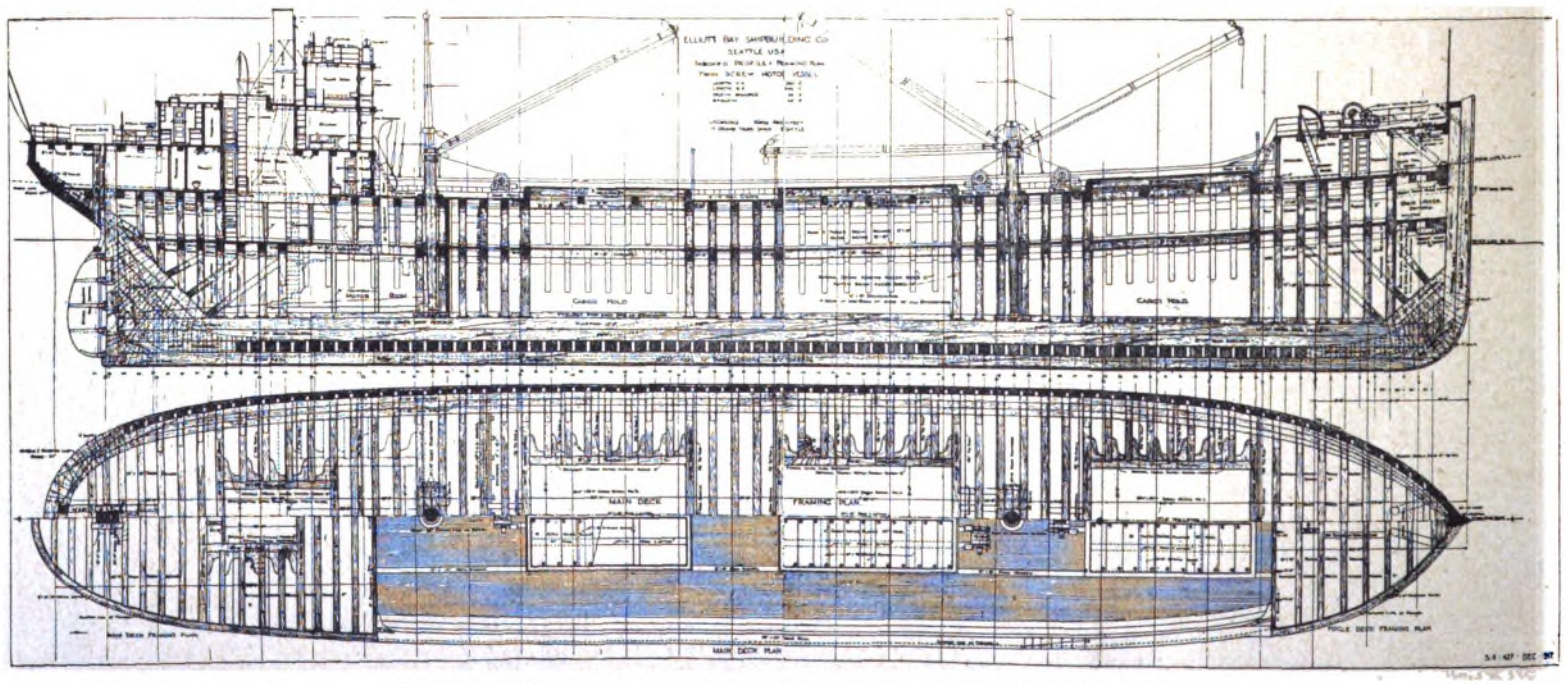
An adequate water system has been installed having a 10" main. This supplies water for fire and drinking purposes. Each ship is equipped inside the hold with running drinking water and also with air-nozzles. A 1,380 A. C. current enters the yard, which is later transformed to 440 D. C. for power and 220 and 110 for lighting. A 250 D. C. current is made for the cranes by means of a rotary transformer.

The lighting system is much to be admired for at any place in the yard there is enough light to see as plain as day. This is done by means of 500 watt lights over the shipways (24 for each ship), 24-200 watt lights and 24-100 watt lamps arranged at regular intervals and heights for each ship. The main yard lighting and the lighting for the mill is accomplished by means of a profusion of the 500 watt lamps placed at advantageous positions. The electrical equipment was supplied by Gray & Barash, electric contractors and engineers of Seattle, Wash.

A blower system is also being erected so as to take care of the mill refuse, which will be consumed by the boiler. The short hauling in the yards is aided by means of Hood tractors which have proved themselves very efficient.

Electric winches built on the grounds snake the timbers in and out the steam boxes, doing away with horses as used in most yards. Among time-saving devices adopted by this yard may be mentioned the electric dubbing machine as made by the Gray & Barash Company of Seattle, which Mr. Dyer, the master mechanic, says the yard would not be able to do without. He states that this machine is surely a godsend to wooden shipbuilders and is worth many times the price in time and money saved and in the quality of work.

The contract which the company has secured calls for the construction of nine full-powered motorships for an Eastern concern. The vessels will be built from designs by L. H. Coolidge, a Seattle naval architect who has been "in the game" for a number of years, and will be of twin-screw type, 260 feet in length, with a moulded beam of 46 feet and a moulded depth of 26 feet, giving them a d. w. c. of 3,000 tons. They will be equipped with twin 500 h. p. 8-cylinder Winton Diesel engines, built by the Winton Engine Company of Cleveland, Ohio, and are to an estimated speed of 9 knots to the ship.



INBOARD PROFILE AND FRAMING PLAN OF 3500-TON MOTORSHIP BEING BUILT

The amount of deck space on this type of vessel being of considerable importance, this feature was given careful consideration and but one deck house has been provided for, located as far aft as possible.

Quarters for both officers and crew are spacious, those for the crew being located forward under the fo'c'sle head and for the officers in the

(Continued on following page)

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SOME REVIEW NOTICES

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The Facts About Ferris

THEODORE E. FERRIS, who acted as naval architect to the Emergency Fleet Corporation, United States Shipping Board, until his enforced resignation a few months ago, has published in pamphlet form the evidence which he laid before the Senate Shipping Committee with a view to proving the falsity of the charge that he had transacted business with government contractors improperly to his personal profit.

This action was unnecessary. Those who know Mr. Ferris personally need no printed evidence of his integrity. He is a man of high principle and may be rightly regarded as the victim of circumstances. Owing to the unfortunate publicity given to a series of incidents only vaguely understood by his critics, Mr. Ferris has been placed in a doubtful position by those who know him slightly and has been substantially wronged before thousands who have followed the incident but casually.

Mr. Ferris is a man who made material personal sacrifices to serve his government in its hour of need and it is painful to realize the possibility that history may not fairly record the facts. Few people realize that after having suffered the lean years of shipping inactivity Mr. Ferris had just reached the most productive period of his career when his services were commandeered by the government. Without warning he was called upon, over night, to leave his personal practice with all its loose ends hanging, in order to serve his country. During the early days of the shipping program Mr. Ferris worked from daylight till midnight, often sleeping in his offices, and in view of the great strain under which he was working at the time it should arouse no surprise that all of the details of his private business were not wound up in a methodical manner. Government business had the right of way and his private practice was thrown into a state of confusion from which he has only now been able to rescue it.

Motorship repeats that in its opinion the facts as it was possible to set them forth clearly after his resignation had been summarily called for, bear out Mr. Ferris's statement that he sought only to serve the government, and it is a sad commentary upon our slap-bang methods of administration that his fate should have been determined before the evidence had been fully canvassed.

While holding implicit faith in his sincerity of purpose, Motorship does not feel that Mr. Ferris is above criticism. On the contrary, in destroying as impractical the plan to power the wooden emergency fleet with oil engines, Mr. Ferris set back the hands of the clock and rejected the opportunity of rendering the nation a great service by recommending this forward step. At the same time Mr. Ferris drew for the government a set of wooden ship plans inferior to those which could have been supplied by any Northwestern naval architect familiar with Douglas fir construction and the ultimate modification of which caused a loss of precious time. Both of these things, however, are purely matters of opinion and we doubt not that Theodore Ferris weighed them to the best of his ability in the limited time at his disposal.

NEW MOTOR SHIPBUILDING ENTERPRISE.

(Continued from preceding page)

deck house and under the poop deck. Comfortable messroom, washrooms and bathrooms have been provided for the crew, and in the officers' quarters will be found, in addition to the sleeping quarters, galley, saloon, hospital, chart-room, and several spare rooms.

The installation of both main and auxiliary machinery will be aft of the watertight bulkhead, and in addition to the main engines there will be at least one auxiliary oil engine and a steam donkey boiler, which will supply the power for operating two deck winches and also be used for heating the ship. The donkey boiler will burn the fuel oil used in the main engines, so that but one kind of fuel will be required. Tanks located in the engine-room wings and in the forepeak will have a total capacity of 1,500 barrels, giving the vessels a big cruising radius.

Because of the fact that both the designer of these vessels and the head of the constructing company have been actively engaged in the designing and building of commercial vessels for many years past, and are well-known to everyone interested in the shipping industry on Puget Sound, the results attained by the new yards and their products will be watched with much interest.

WAR DEPARTMENT TO ORDER DIESEL ENGINES.

Orders for a large number of marine Diesel and steam engines, ranging from 100 to 1000 b. h. p. each, for tugs, mine planters, freighters, and passenger vessels, will be placed before July next by the War Department. Builders of Diesel engines should send bids and specifications and complete details to Capt. H. L. Woolverton, Water Transport Branch, Embarkation Service, Purchase, Storage and Traffic Division of Assistant Chief of Staff, War Department, Washington, D. C.

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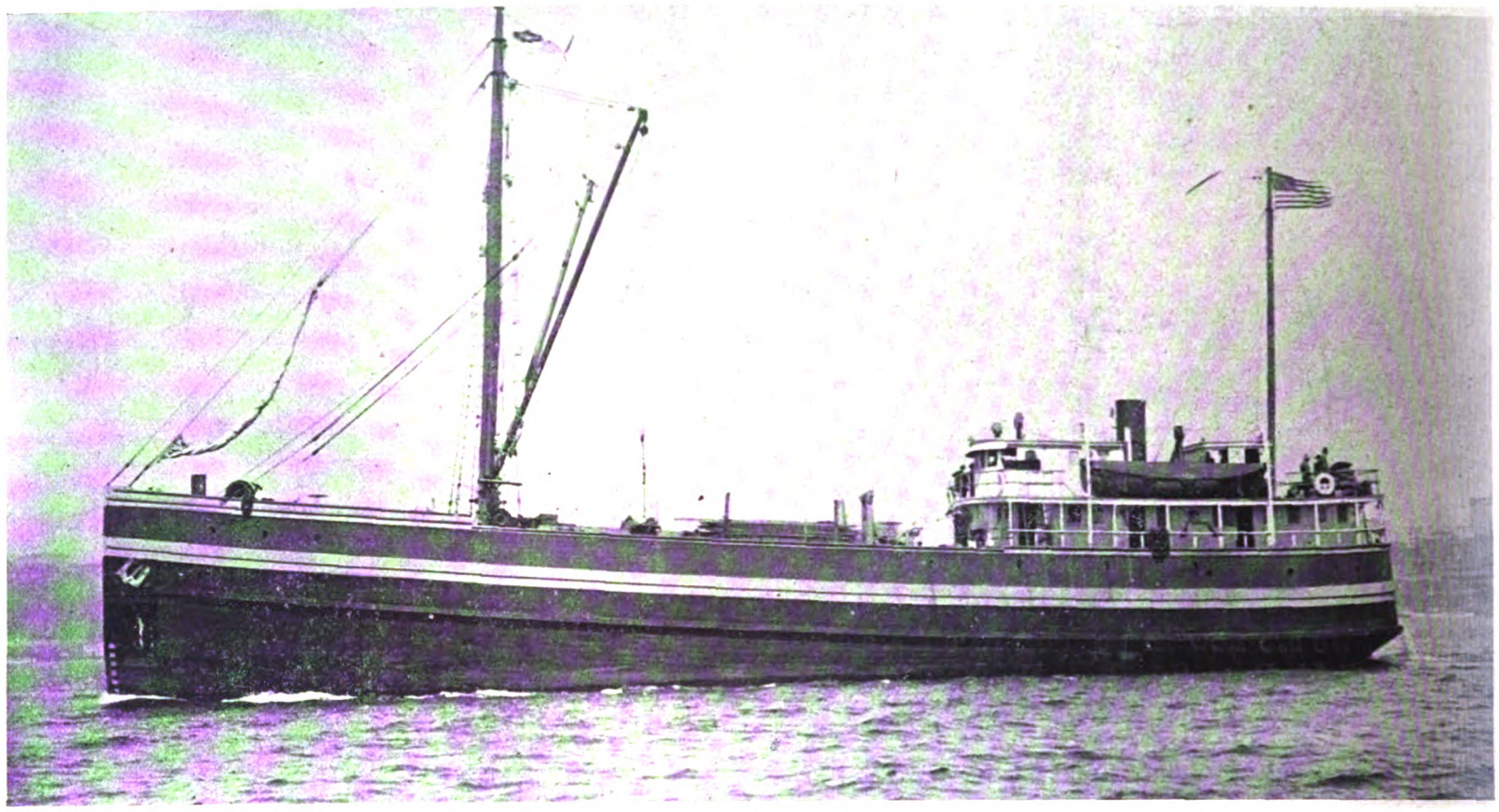
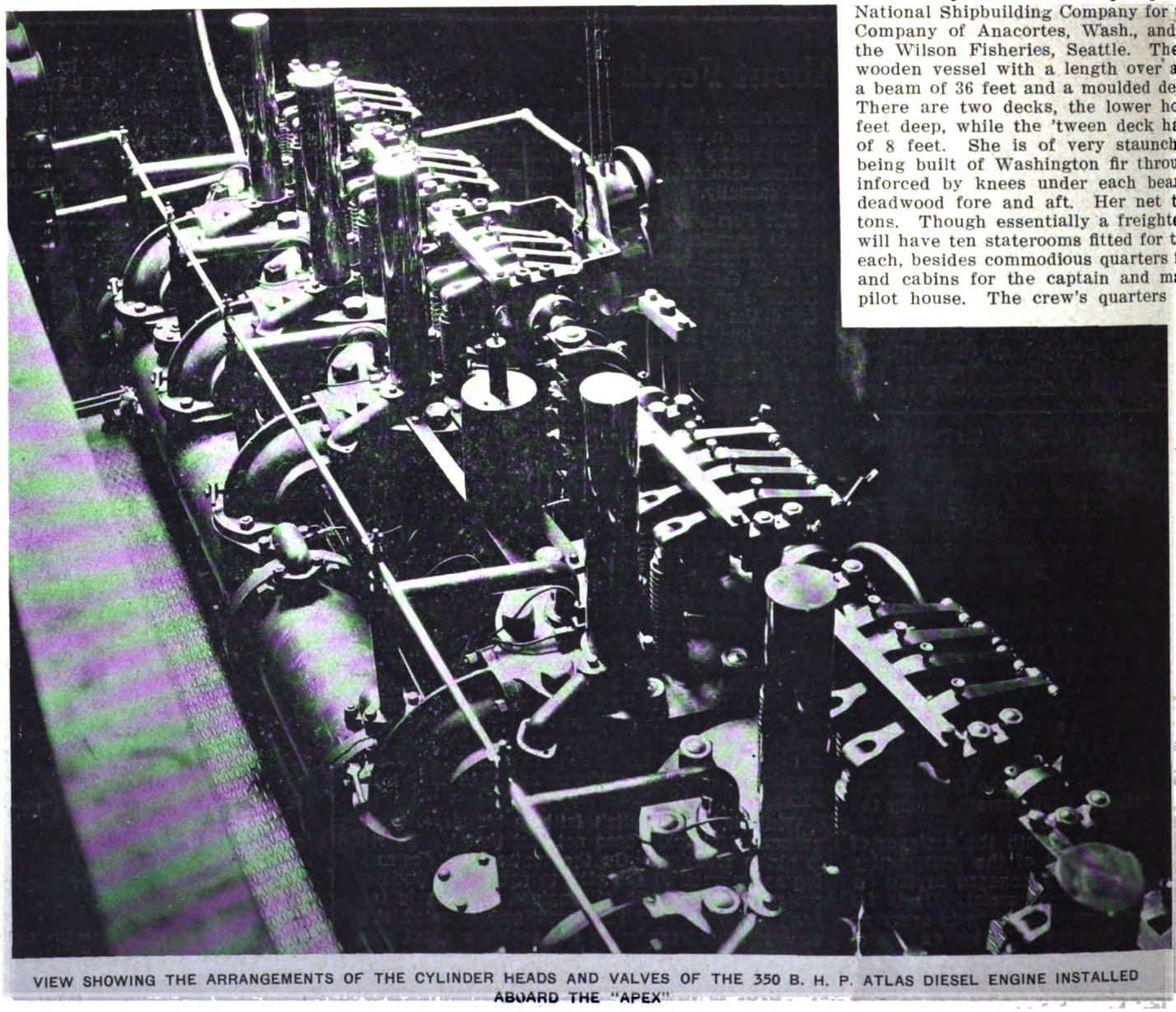
New Full-Powered Motorship for the Alaska Salmon Trade



THE FULL-POWERED MOTORSHIP "APEX" ON HER TRIAL TRIP

THE Pacific Coast fishing industry was one of the very earliest large scale users of internal-combustion motors for marine purposes to become acquainted with the surface-ignition and full-Diesel types of oil-engines in their operations of various natures. As a result in this region at the time of writing there are as many as fifty vessels, ranging from 60 to 160 feet in length, using those types of motors as their main propulsive power. A few of these have been described in Motorsh.p from time to time.

The latest addition to this rapidly growing fleet is the full-powered motorship "Apex" built by the National Shipbuilding Company for the Apex Fish Company of Anacortes, Wash., and later sold to the Wilson Fisheries, Seattle. The "Apex" is a wooden vessel with a length over all of 155 feet, a beam of 36 feet and a moulded depth of 19 feet. There are two decks, the lower hold being 13½ feet deep, while the 'tween deck has a clearance of 8 feet. She is of very staunch construction, being built of Washington fir throughout and reinforced by knees under each beam with ample deadwood fore and aft. Her net tonnage is 62[illegible] tons. Though essentially a freighter, the "Apex" will have ten staterooms fitted for two passengers each, besides commodious quarters for the owners and cabins for the captain and mates abaft the pilot house. The crew's quarters are under the



VIEW SHOWING THE ARRANGEMENTS OF THE CYLINDER HEADS AND VALVES OF THE 350 B. H. P. ATLAS DIESEL ENGINE INSTALLED ABOARD THE "APEX"

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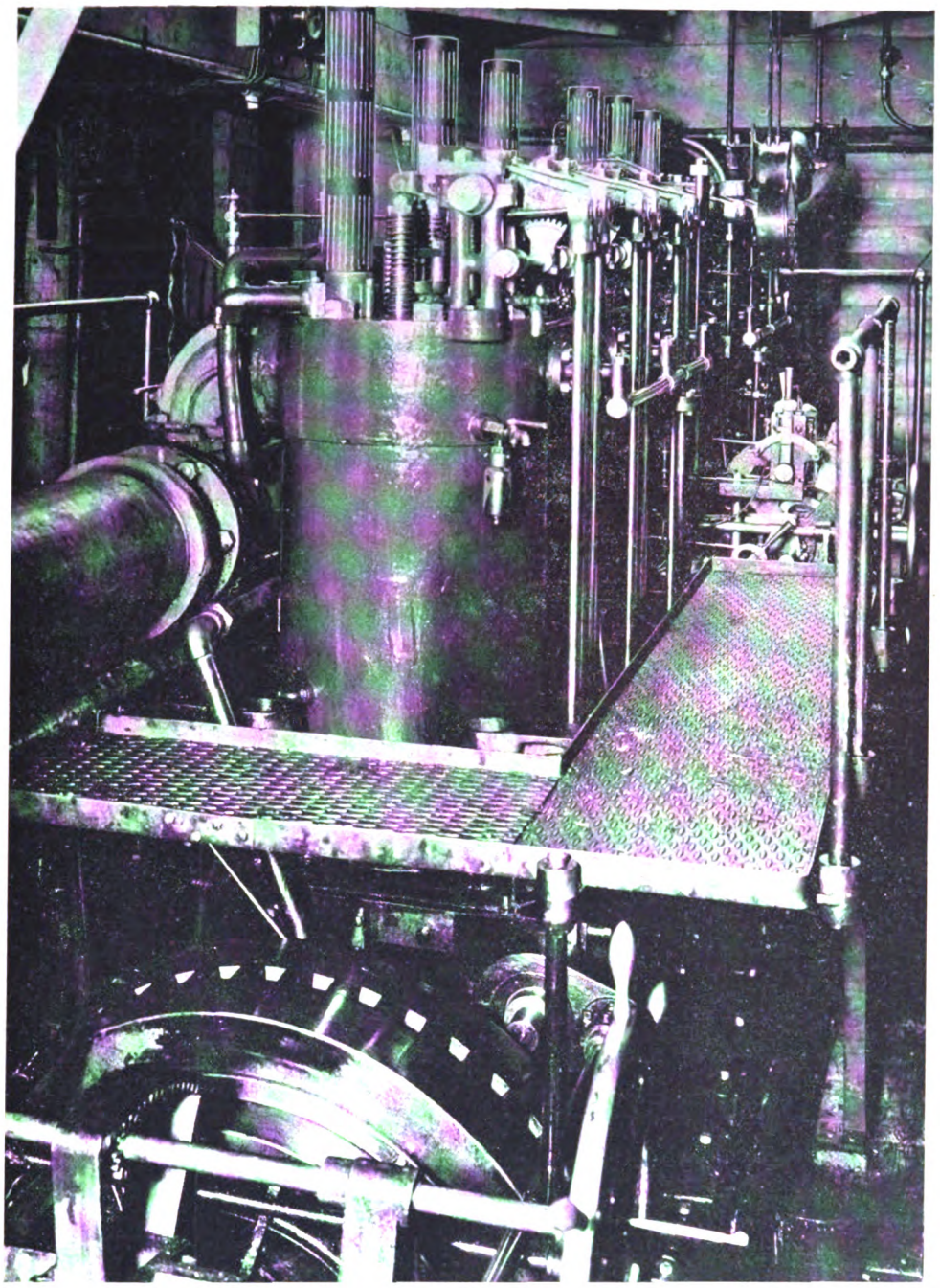


THE 350 B. H. P. ATLAS DIESEL MOTOR OF THE "APEX"

forward deck and will house twenty-eight men. On the main deck are the guest staterooms, the dining-room, and galley, the cook's stateroom, just off the galley, and the wireless house. The pilot house is located on a deck above the dining-room.

All the latest equipment for the comfort and safety of the ship's passengers and crew has been placed aboard the ship. Her engine-room installation is placed just aft of midships and the accompanying photographs will show plainly the excellent installation the main engines of the "Apex" make. Her main propulsive power is generated by a single Atlas Diesel engine of 350 b. h. p., manufactured by the Atlas Gas Engine Company, of Oakland, Cal., which develops her rated power at 195 r. p. m. On the test blocks at Oakland before shipment these engines developed 390 b. h. p. at about 290 r. p. m.

The auxiliary equipment consists of a 36 h. p. gasoline motor built by the builders of the main engines, which drives a 17 KW. Westinghouse generator. This supplies power for the main lighting of the ship and also power to the deck winches and anchor hoists. A 50-cell Exide storage battery supplements this generator, as an auxiliary. A two-cylinder, 9 h. p. gas engine, of the same make as the others, drives the compressor for the starting air. Lubrication is by the Manzell force-feed system.

The deck machinery was built by the Pacific Machine Shop & Manufacturing Co. of Seattle. It is of the same type as has been installed in practically all of the wooden motorships built in this region. This machinery is driven by power generated by the 36 h. p. gasoline engine mentioned above. The steering gear is of the ordinary hand-steering type. Wireless equipment is installed in a house just aft of the pilothouse, on the second deck.

On her trial trip the "Apex" averaged over a measured course, with and against the tide, better than 9 knots, giving entire satisfaction to the owners and the representatives of the builders, O. E. Nilsen. Directly after the trials she proceeded to Anacortes to take on a cargo of cannery supplies for the owners' canneries in Alaska.

THE McCORMICK AUXILIARY SAILING-SHIPS.

The M. S. "City of Portland" Adds to Her Laurels.

IN more than one way the operation of the motor-auxiliary sailing-ship fleet of the Chas. McCormick Steamship Co., of San Francisco, Cal., is a revelation of the enormous value of efficiently built and efficiently operated merchant-ships of this class.

Because of the splendid results obtained with the first two large auxiliary sailing-ships owned by this well-known Pacific Coast Company (see Motorship for August, 1917,) we are not surprised that it is their opinion that this type of vessel is bound to become a permanent type in the tonnage of the world, and that they will operate at a profit in competition with steel coal-burners in any port of the world.

Although the owners frankly state that these vessels are under-powered and that the motors should be of at least 400 b. h. p. additional, "Motorship" is of an opinion that, as a commercial proposition, these oil-engined auxiliary wooden sailing ships of McCormicks will make a far better showing that any of the Ferris-type wooden full-powered wooden coal-burning steamships that have been standardized by the Emergency Fleet Corporation.

As we write we have received a telegram from Mr. W. R. Hewitt, the superintendent engineer for McCormick Bros., as follows:

"'City of Portland' arrived Portland, Maine this morning. 'Frisco to Canal seventeen days. Colon to Portland (Maine) fourteen days. In fine shape."

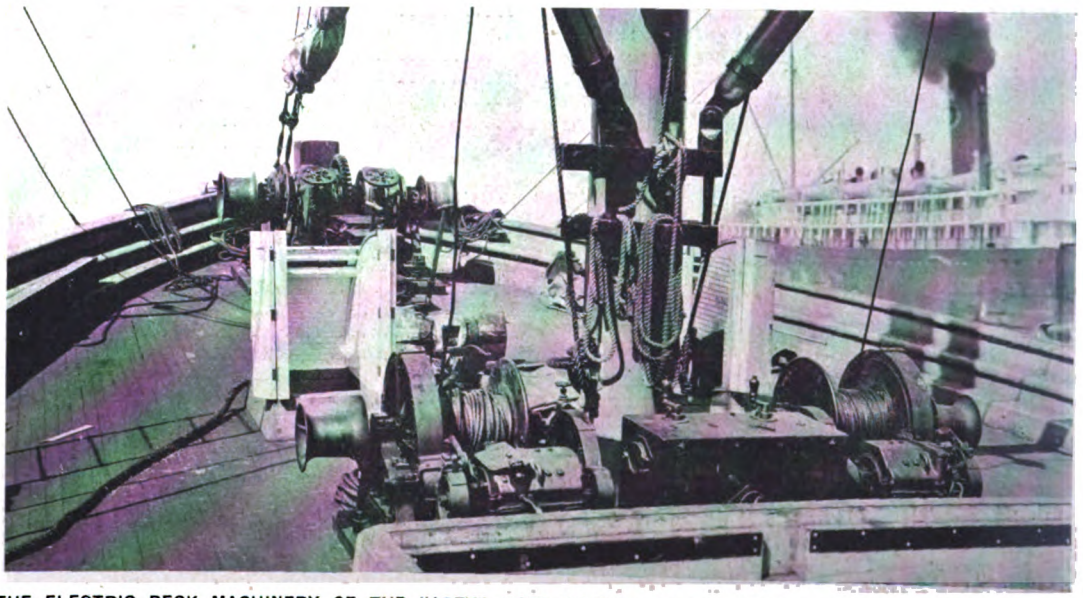
Such a fine performance for an auxiliary sailing-vessel needs no comment, except that it is a pity that the merits of such vessels should have been overlooked by Washington to the extent that none have been ordered.

The "City of Portland," like her sister ship, is powered with two 320 b. h. p. Bolinder surface-ignition oil-engines and can carry well over 3,000 tons of cargo in addition to fuel, water, etc., yet has a displacement (loaded) of only about 5,000 tons. For their overall dimensions and average speed these vessels certainly are remarkable cargo-carriers, the amount of net cargo-capacity per ton of material used in their construction far exceeding that of the standardized wooden steamships.

TRIAL TRIP OF THE "MOUNT HOOD"

Better Than 10½ Knots Made by Winton Engined Ship.

The full-powered motorship "Mount Hood," of which we gave an illustrated description in the April issue of Motorship, ran her official trials Sunday, April 21, on the Columbia River. A letter to Motorship from Capt. Dent, in command of the "Mount Hood," gives the details of the trip: "Vessel ran her trials on Sunday last and everything was entirely satisfactory. Engines (Winton of Cleveland) working excellently. She attained a speed of over 10½ knots, turning at 232 r. p. m. All auxiliary machinery worked well. The electric steering gear, after being properly adjusted, gave no trouble. Better trial trip expected when the ship puts out for Grays Harbor, where she will load her cargo for her maiden voyage."



THE ELECTRIC DECK MACHINERY OF THE "APEX" MADE BY THE PACIFIC MACHINE SHOP AND MANUFACTURING COMPANY, SEATTLE, WASH.

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